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NORFOLK Bird & Mammal Report 1978

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Norfolk Naturalists' Trust Properties

Date Acquired		Acreage		Status*
	On the Coast			
1926	Cley Marshes	435	Gift	S.S.S.I.†
1937	Duchess's Pightle, Burnham Overy ...	1	Gift	——
1937	Great and Little Eye, Salthouse ...	10	Purchased	S.S.S.I.
1945	East End of Scolt Island	76	Purchased	N.N.R.
1955	The Eye, Salthouse	21	Purchased	S.S.S.I.
1965	Holme Dunes	400	Purchased, Gift & Agreement	S.S.S.I.
1971	Salthouse Marshes	200	Agreement	S.S.S.I.
	Broadland			
1928 and 1974	Starch Grass (Martham)	43½	Purchased & Gift	S.S.S.I.
1930	Alderfen Broad	72	Purchased	S.S.S.I.
1945 and 1969	Hickling Broad	861	Purchased	N.N.R.
1945	Hickling Broad	500	Leased	N.N.R.
1945	Barton Broad	355	Half Gift &	S.S.S.I.
1952	Barton Broad		Half Purchased	S.S.S.I.
1948	Surlingham Broad	253	Purchased	S.S.S.I.
1949	Ranworth Broad	124	Gift	N.N.R.
1949	Cockshoot Broad	12	Gift	N.N.R.
1964	Firs Marsh, Burgh St. Peter	2½	Leased	——
1971	Martham Broad	103	Leased	S.S.S.I.
1972	Hardley Flood	90	Leased	——
1972	Chedgrave Common	10	Leased	——
1974	Barton Marshes	10¼	Gift	——
1979	Upton Fen	130	Purchased	S.S.S.I.
	Breckland			
1938	East Wretham Heath	362	Purchased & Gift	S.S.S.I.
1942	Weeting Heath	343	Gift	N.N.R.
1949	Thetford Heath	250	Gift	N.N.R.
	Other Areas			
1957	Thursford Woods	25	Gift	——
1960	Hethel Old Thorn	⅛	Gift	——
1961	Scarning Fen	10½	Gift	S.S.S.I.
1962	Hockham Fen (Cranberry Rough) ...	20	Purchased	S.S.S.I.
1963	Roydon Common	140	Purchased	S.S.S.I.
1966	Stoke Ferry Fen	25	Agreement	S.S.S.I.
1968	Lenwade Water	37	Agreement	——
1968	Dickleburgh Pightle	1	Agreement	——
1972	Smallburgh Fen	19	Leased	S.S.S.I.
1972	Ringstead Downs	26	Agreement	S.S.S.I.

(Continued on inside back cover

Norfolk Bird Report - 1978

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Norfolk Mammal Report - 1978

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Editorial

The Council of the Norfolk Naturalists Trust, in co-operation with the Norfolk & Norwich Naturalists Society, is pleased to present the annual report on the birds of Norfolk.

Review of the Year: Undoubtedly one of the highlights of the year occurred in early January when an Ivory Gull, an Arctic species and an addition to the county list, appeared suprisingly at Brancaster. The bird fed frequently on an almost totally buried seal on the beach and allowed a close approach by those observers fortunate enough to see it. Its pigeon-like appearance on the ground was in total contrast to its graceful flight. Another subsequent unexpected find in January was a Richard's Pipit which stayed at Holme for three weeks, the first wintering record of this Asiatic wanderer in the county.

An obliging Red Kite spent two days in the Buxton-Oxnead area in early February. Shortly afterwards a fornight of cold weather occurred, but apart from hard weather movements of thrushes in particular this period produced little of ornithological interest. In contrast to 1977 the early summer migrants reverted to their more normal pattern of delaying their arrival until nearly the end of March in most instances. Nevertheless many observers spent long periods watching a Crane which frequented the Holt area for much of the month.

Generally April was disappointing with cold easterly or northerly winds for much of the time and no major movements of migrants until well into the month. However, as usual, April produced its surprises. On the 28th one fortunate observer was standing in the right place at Cley to see a Black Stork, a wanderer from Eastern Europe, fly in off the sea and pass over his head. Two days later another addition to the county list, an Alpine Accentor, appeared on the cliffs at Sheringham.

May is normally one of the most interesting months of the ornithological calendar and 1978 proved to be no exception. It was generally cold and exceptional numbers of winter visitors, especially Fieldfares, remained well into the month. In the first fortnight frequent north-easterly winds resulted in above-average numbers of Wrynecks, Pied Flycatchers and Red-backed Shrikes. As one coastal observer remarked it was more like autumn than spring! A Broad-billed Sandpiper appeared at Breydon during this period and later in the month a Great Reed Warbler was found at a West Norfolk locality. On the 28th a Pied Wheatear was seen at Winterton; this spectacular black and white bird, a vagrant from South-east Europe and another addition to the county list, was almost certainly the bird of the year. What was amazing about this record was that not only did it occur at the same locality as the Isabelline Wheatear in 1977 but it was also seen on the same date and found by the same observer.

The highlight of the breeding season was undoubtedly the successful breeding of Montagu's Harriers. Avocets again had a successful season, but Bitterns showed no recorded sign of any improvement. Similarly, submitted records suggested that Bearded Tits had a poor season.

One feature of recent years has been the appearance of one or more waders during the mid-summer period and 1978 saw a brief visit of a Terek Sandpiper to Breydon on 5th July. The east coast was also rewarded near the end of the month with a passing Red-footed Falcon at Winterton.

August and September are the traditional months for drift migrants, but apart from a small 'fall' on 6th September there was a virtual absence of such species. Despite the lack of birds 'in the bushes' the heron family was well represented with Little Egret at Winterton, Little Bittern at Cley and Purple Heron at Snettisham; a Crane also made a prolonged stay at Welney. Sea-watchers were rewarded with several records of Cory's Shearwaters and Long-tailed Skuas and two Sabine's Gulls remained for several weeks in the Holme area. Above average numbers of Little Stints and Curlew Sandpipers appeared during this period, with a White-rumped Sandpiper at Breydon and a Broad-billed Sandpiper at Wolferton. The only unusual passerines were single Serins at Sheringham and Holme.

The last day of September not only saw the appearance of several petrels on the coast, but also a change of wind direction to the north east. Next day produced the first reasonable fall of migrants of the autumn, especially Redstarts. Generally October was mild with winds mainly from southerly direction, as opposed to the hoped-for easterlies. Nevertheless a vast fog bank over the whole of the southern North Sea and light winds on the 13th resulted in a most surprising selection of far eastern rarities on 14th/15th with a Desert Wheatear on Blakney Point, 2 Short-toed Larks at Weybourne and a Radde's Warbler at Holkham. As frequently happens these birds, due to their disorientation, stayed for several days; the Desert Wheatear, because of its tameness, must have been the most photographed bird in the county for many years! The second half of the month saw a steady arrival of winter visitors with a major immigration on 27th/28th which is described in detail on pages 8—10.

November and December saw the arrival of Rough-legged Buzzards and a Red Kite, together with a major influx of Hen Harriers which continued into 1979.

Acknowledgements: Thanks are due to G.M.S. Easy for the cover drawings of Desert Wheatear and Hen Harriers and for text illustrations; also to Dr. K. J. Carlson, P. R. Clarke, A. L. Howes, J. Pick and R. Powley for photographs and vignettes; to Holme Bird Observatory/N.O.A. for access to records; to the Norfolk Naturalists Trust Wardens; to the National Trust (Blakeney Point); to the Nature Conservancy Council (Scolt Head, Holkham, Bure Marshes (Woodbastwick) and Hoveton Great Broad); to the Cambridge Bird Club; to Gt. Yarmouth Naturalists Society; to P. R. Allard and D. A. Dorling (for compiling the annual record cards); to Mrs. M. Dorling, J. T. Fenton, P. D. Kirby, Mrs. P. Rix and Mrs. S. F. Seago for valuable assistance and to all other contributors.

Recording: Records for the 1979 Report (including field descriptions of rarities and semi-rarities) should be sent *by the end of January* to Michael J. Seago, 33 Acacia Road, Thorpe St. Andrew, Norwich NR7 0PP. Contributors are requested to submit notes in the order followed in Dr. K. H. Voous' *List of Recent Holarctic Bird Species* (1977). In order to minimise the work involved, records will not normally be acknowledged. The names of all contributors will be included in the Report. It will be appreciated that delays in receiving observations create considerable problems for the Recorders, the Records Committee and the printers. For several reasons it is essential that publication is achieved by early September.

The County Records Committee (P. R. Allard, G. E. Dunmore, D. J. Holman, S. C. Joyner and J. Kemp) considered more records than ever before in 1978 and were pleased to note an increased number of descriptions submitted at the same time as observers' records. Unfortunately the number of records rejected also increased compared with previous years and co-incidentally the majority of such records related to descriptions requested by follow-up letters. The Committee experienced particular difficulties especially with various birds of prey including Goshawk, Buzzard and

Peregrine and would comment, having regard to the members' own experiences, that often large raptors cannot be identified for certain especially if viewed only at long range. In addition several Peregrine records did not rule out the possibility of escaped Lanner Falcons.

The Committee has also given consideration to the problems of identification of various races and sub-species often reported in the Classified Notes and would request, in future years, that descriptions be submitted for the following: Balearic Shearwater, Northern Tree Creeper, Northern Long-tailed Tit, Scandinavian Rock and Water Pipits and Grey-headed and Ashy-headed Wagtails.

Finally the Committee would be pleased to advise any observer the reasons why a particular record was not accepted for publication and are willing to reconsider any previously rejected records on receipt of additional information. Any such correspondence should be addressed to the Editor in the first instance.

PIED FLYCATCHER — A NEW BREEDING SPECIES FOR NORFOLK

Felbrigg Park is National Trust property in north-east Norfolk. It consists of extensive areas of parkland, deciduous woodland and the inevitable coniferous plantations. The most important tract of woodland is the Great Wood; of about 500 acres, it is made up of an attractive mixture of beech, oak and sweet chestnuts and to a lesser extent holly, Scot's pine and Sycamore.

The wood holds a thriving population of birds, including several of the less common Norfolk species: redstart, lesser spotted woodpecker and, in certain years, wood warblers. 1978 was an exceptionally good year for redstarts, with up to 11 males singing in May and at least 4 fledged young. There were no wood warblers, but the totally unexpected discovery of a pair of pied flycatchers more than compensated.

In Great Britain, the preferred habitat of pied flycatchers is mature sessile oak woodland. The best examples of this exist in western England and Wales, where the upland valleys hold the bulk of the population. Within the last forty years their range has expanded considerably, and they are now found in southern Scotland, and north and south-west England. By no means exclusively confined to oak woods, they may be found anywhere where there are sufficient numbers of nest-sites and a plentiful supply of food.

The Felbrigg territory seemed atypical of the British pied flycatcher habitat. The nest, in a Scot's pine, was situated amid a group of very large beech trees and sweet chestnuts on the southern periphery of the wood. There were several pine plantations adjoining the deciduous trees and a large clearing to the south.

Due to incredible good fortune, the actual nest-site was located quite easily; the nesting tree was adjacent to the footpath, the hole not obscured by overhanging foliage and the female made frequent visits to the entrance hole, while carrying nesting material: dry grass. The cock bird also helped location by remaining on the exposed branches of a nearby chestnut tree, pouring out his chaffinch-like song.

During the following month, the progress of the birds was monitored by several birdwatchers, but the situation remained more or less constant until the chicks had almost fledged. The male was invariably found on the same branch of the chestnut tree, occasionally disappearing on hunting expeditions, or, as happened on several occasions, making sorties up to the nest-hole apparently to feed the female. He continued singing until the young were nearly full grown.

At this point it is worth mentioning that an unmated male may sometimes occupy a suitable nest hole and defend a territory, giving the impression that breeding has taken place and that it is feeding young. Even though the female had been seen carrying nesting material into the hole, we could not positively confirm that the flycatchers had nested until much later when both birds were making frequent visits to the hole. There was even more conclusive evidence when an adult removed a faecal sac from the nest.

About five weeks after the pair was first discovered, the chicks fledged. As is usual with this species, the family completely disappeared in the dense tree cover of the wood, consequently we were not able to ascertain how many young were raised.

These events constituted the first breeding record for the species in Norfolk, and almost certainly in East Anglia. However, of equal interest was the presumed origin of the pair. The late spring of 1978 was characterized, at least in Norfolk, by predominantly easterly winds. Associated with this weather pattern was an unusual number of Scandinavian species normally associated with autumn drift-movements. On the North Norfolk coast, wrynecks and red-backed shrikes were far more numerous than usual. There were also more records in the county of pied flycatchers. As has been said earlier, the number of singing redstarts at Felbrigg was unprecedented, at least in recent years. Whereas British and German pied flycatchers lay their eggs in the first half of May, they are rather later in Finland and the Felbrigg pair could not have laid until after June 9th. Finally, the breeding pied flycatchers chose to nest in a Scot's pine, a habit which is extremely uncommon in their normal British breeding range. Considering all these points, their seems little doubt that the Felbrigg pair was of Scandinavian breeding stock, their arrival being associated with atypical spring weather conditions.

NEAL TAYLOR & MOSS TAYLOR.

IVORY GULL, WANDERER FROM THE HIGH ARCTIC

A flush of pink sunlight tinted an otherwise lifeless grey sky as we rounded Brancaster beach-gap and followed the shore eastwards in the direction of Scolt Head. At first glance life seemed minimal, but when we scanned the distant tide-line, what was at first thought to be a white polythene sack suddenly raised its head and entered, so to speak, the land of the living. Was it perhaps some sort of snowy-white carrier pigeon? We soon saw that the reason for the bird's intent stillness was the appeasement of hunger, for underneath its tearing beak gleamed the irridiscent head of a drake mallard, and though we were now within 40 yards of our quarry, mere human presence would not, as yet, induce this strange bird to leave its succulent breakfast.

On the ground it did indeed resemble a carrier pigeon, and boasting a thick horn-coloured beak was quite unlike any other sea bird of our acquaintance. Its legs were black and comically short, while the feet were webbed and splayed out flatly, suggesting a stout strength. The snowy whiteness of the plumage was relieved only by measly black dots on the back and tail, and a crow-dark bill which merged into a smudge of dark feathering around the eye and under the chin; in short it looked like a very white bird which had recently had its head tipped, a quarter way only, into a bottle of ink!

We advanced a few steps nearer, and were soon able to identify it as an immature ivory gull, a bird of the most northerly Arctic ice-packs and a species never before recorded in Norfolk. Eventually, it became aware of an unacceptably close presence and flew about 100 yards to the west, where it instantly began to feast on the half-eaten corpse of a small wader, which was a poor sort of exchange for a mallard. The gull thought so too for on the homeward walk when we necessarily disturbed it a second time, it quickly sailed back again to its more substantial meal of wild duck.

In flight the startling whiteness of the feathers was even more apparent than on the tideline, though the outspread tail and wing-quills were delicately tipped with a row of black dots like the edge of a butterfly's wing. Two or three times it soared almost vertically into the grey wintry sky, keeled over for a brief second, and then gently swooped down again to the carrion on the tideline. Buoyant and tern-like it flew as

f borne on invisible air currents. Only on the shore, supported by those inadequate egs, did it appear dumpy and somewhat clumsy.

Unfortunately, this stranger's stay in Norfolk was short-lived. It was last observed January 9th on the beach by Gun Hill before heading eastwards. Within 48 hours gale-force winds suddenly sprange up producing a wild night with heavy rain.

M. R. CLARKE

Mute Swan Census

During 1978, a census was undertaken of the Norfolk mute swan population. The survey, part of a European-wide census, was jointly organised in Britain by the British Trust for Ornithology and the Wildfowl Trust. Similar counts were made in Britain in 1955 and 1961 and the results are therefore directly comparable. In Norfolk, over fifty observers were involved and for all their efforts the county organisers were extremely grateful.

In April and May, Norfolk held a total of 1035 mute swans, of which 126 were classified as non-breeding territorial birds, whilst of 137 breeding pairs, all but ten were successful. The largest herd of non-breeders (108) was located on the River Ouse at King's Lynn. The location of breeding pairs was as follows (single pairs unless otherwise stated):

Rivers: Ant, Bure 6, Burn 2, Glaven, Ingol, Nar 2, Ouse 3, Tas 2, Thet 2, Thurne, Waveney 14, Wensum 3, Wissey 3 and Yare 4. *Broads:* Blackfleet, Hickling 3, Horsey 3, Hoveton Little, Ranworth, Rockland, Rollesby and Upton. *Lakes and Ponds:* Didlington, Fowlmere, Fritton Decoy, Hardley Flood, Holkham Park, Holme, Lound, Narford, North Elmham, Raynham Hall, Runhall, Shadwell Park, Snettisham, Stoke Ferry, Stradsett and Wortwell. *Gravel Pits and Flooded Marshes:* Beetley GP, Brancaster, Breydon, Burgh St. Peter 2, Cantley, Chedgrave, Crostwick GP, Dersingham, Elsing, Fritton 2, Haddiscoe 6, Halvergate 8, Hardley Flood 2, Hempstead Heath, Lenwade, Lyng 2, Norton, Ouse Washes 9, Pentney GP, Postwick, Reedham 4, Salthouse, Snettisham 2, Somerton Holmes, Stokesby, Stowbridge GP, Thurlton 2, Westacre GP, Wickhampton 4 and Wiveton. *Reservoirs:* Gressenhall and King's Lynn.

Surprisingly, only 33 out of a possible 64 ten-kilometre squares, wholly or partly within Norfolk, held at least one breeding pair. Although the overall mute swan population was virtually the same as in 1961, there have been some interesting changes during the intervening years, the most significant of which relate to the Broads. Whereas, in 1961, Hickling Broad alone held a herd of 320 non-breeders, in 1978 the entire Broads accounted for only 69, of which a mere 22 were at their former stronghold. Breeding pairs throughout Broadland showed a similar decline — on the Broads from 24 to 12 pairs, and on the River Bure and Yare, from 20 to 6 and from 18 to 4 respectively.

Fortunately, it appears that these swans have not been lost altogether, for corresponding increases in both breeding and non-breeding birds were recorded on the Halvergate and Haddiscoe Marshes. In addition the number of breeding pairs on the River Waveney doubled to 14.

Although it would be tempting to blame the increase in holiday craft in Broadland for this decline, the same effect should be apparent on the River Waveney, when in fact the reverse is true. It would seem more likely therefore that the decimation of the swan population in Broadland, in common with the fall in numbers of other wildfowl, is largely attributable to another factor, possibly the pollution caused by the enormous winter gull roosts at Hickling.

MOSS TAYLOR

Late autumn land bird immigration in North-West Norfolk

On Oct. 28th 1978 an impressive immigration of European passerines at Hunstanton was ambitiously assessed by T. Talbot and the writer. Conditions had seemed suitable for such a venture with slack winds over-night in the southern part of the North Sea and a sea mist reported; more to the point a heavy immigration had been noted in NE Norfolk the previous morning.

The first counts at Heacham highlighted the southward movement of Fieldfares; between Heacham and Hunstanton Starling and finch movements were conspicuous and at Hunstanton Cliffs the Starling and Chaffinch passage was even more pronounced. In marked contrast the number of birds passing over Holme Dunes/Holme Bird Observatory was insignificant although the western movement was visible towards the high ground nearer the coast road and to some extent over low-lying meadowland. Along the sea wall/dunes only Skylarks were passing in numbers comparable to earlier counts.

The movement was amongst the heaviest observed off this coast and was certainly the most significant assessed there. Along the North Coast Holme - Titchwell, birds were passing in a concentrated band along the coast-facing ridge and over the adjacent meadows and marshes. The coastal dunes attracted a more diffuse movement; here and over the sea for approximately 4 kilometers a westerly heading by Skylarks was a prominent feature.

Due to the high tide and sea mist the movement veered SW at Hunstanton Cliffs. As usual some confusion resulted when some of the coasting birds continued on their westward course, lost sight of land, then returned to the Cliffs from a NW direction. It was at this point that the finches were most concentrated and low enough to be easily identified. Starlings were most conspicuous, but the wide path taken by the flocks, mainly Clifftop — Hunstanton Park but often over the sea, did cause problems when counting the passage. Fieldfares were at their most inconspicuous at this point, most passed 2 kilometers inland, not visible from the lighthouse observation centre.

South of Hunstanton the Fieldfare flocks had converged but the Starling movement had become more diffuse: some birds had continued out to sea to WSW, others were making off on a more southerly course. The finch movement had not only become more scattered but was at a considerably higher elevation, making identification more difficult. At Heacham the Fieldfare hordes continued south in impressive style over the low lying meadows all other species had spread widely over sea and shore and the finch flocks, rising still, were difficult even to see.

By combining the counts made at the various locations it seemed reasonable to deduce that during the morning 120,000 Starlings, 50,000 Chaffinches, 15,000 Fieldfares, 3,500 Skylarks, 2,000 Bramblings, 1,000 Redwings, 1,000 Meadow Pipits, 500 Greenfinches and 500 Linnets had turned down the Wash coast, along with smaller numbers of Lapwings, Snipes, Collared Doves, Corvids, Twites, Rock Pipits, Blackbirds, Song Thrushes, 80 Siskins and House Sparrows. A few flocks of Long-tailed Tits moved in with Blue Tits, also involved were Reed Buntings, Yellow Buntings Mistle Thrushes, Coal Tits, House Martins, 4 Lapland Buntings, Pied Wagtails, an unidentified falcon and a male Hen Harrier which headed high to S over the sea at Heacham.

A similar movement had been evident the previous day according to H. R. Ramsey; however Fieldfares had been more conspicuous during that arrival.

Fortunate observers at Brancaster found this Ivory Gull remarkably fearless. It remained in the area five days. *Photo: P. R. Clarke*

This male Desert Wheatear stayed between Blakeney Point and Cley four days in mid-October. The nearest breeding grounds are in North Africa. *Photo: J. Pick*

Hen Harriers were one of the main features of the 1978-79 winter. The first birds reached Hickling and Cley October 2nd. By the end of the year five were present at both Strumpshaw and Scolt Head with four at Roydon Common. *Photo: Dr K. J. Carlson*

NATURAL HISTORY

Hunstanton presents a unique problem for migrating birds. At no other site along the North Sea facing coastline of the British mainland are birds confronted with a situation where the sea lies at almost 250° between SSW and ENE directly barring their passage route. In spring this results in a movement south along the Hunstanton Stretch, more especially of hirundines, completely opposite to their intended heading. In autumn, during a normal WSW immigration in fine conditions when the Lincs. coast is visible, the movement S at Heacham is usually confined to the Fieldfare/ Redwing element; the majority of the Lapwings, Starlings, Skylarks and finches head out over the Wash continuing their W/WSW/WNW passage. Even Fieldfares/ Redwings take a SW/W heading once the mud of the South Wash has been encountered.

When sea fog or mist shrouds the distant shores of the Wash a movement similar to that of Oct. 28th will result. The concentrated movements rather depend on such features as the state of the tide: when at a low ebb and the mudflats are exposed a high proportion of the birds fan out over the saltings and few pass down to the Norfolk S.Wash shores.

During the 1950s the Cambridge Bird Club made some attempt to track down the routes taken during these arrivals. On Oct. 23rd 1956 one observer was aboard the Lynn Well lightship when a heavy movement was noted at Holme of 8,000 Starlings, 4,355 Chaffinches, 160 Greenfinches, 60 Linnets, 50 Bramblings, 13 Lapland Buntings and 8 Shorelarks. Most of these turned SSW at Gore Point, yet a considerable proportion of the Starlings set out from Gore Point across the Wash. Since nothing of this movement was reported from the lightship it was considered that birds continued across on a SW or W course.

Certainly the most thorough of these surveys was that of Oct. 18th - 26th in 1958; which perhaps provided the key to the wash movements. From watches along the N. Norfolk coast Hunstanton - Holkham, it was suggested that 200,000 Starlings, 30,000 Skylarks, 20,000 Lapwings, 18,000 Black-headed Gulls, 4,800 Chaffinches and 1,100 Meadow Pipits coasted W on 19th. This movement turned into the Wash at Hunstanton, mainly crossing the Wash towards Holbeach/Nene Mouth. The extent of this southward movement down into the Wash from Hunstanton was usually governed by the previous mentioned factors: the state of tide and weather conditions.

"As has been found annually since regular watching on diurnal migration was started in 1950 (Bourne, Smout, Vine *et al*), the course taken by birds after Hunstanton varies between WNW across the Wash and S down the coast past Snettisham. Generally, most birds keep to the coast early in the day, at high tide and especially in poor visibility and the numbers crossing the Wash (mainly to the SW) tend to be greatest in good visibility and during the day. At low tide when large expanses of mud are exposed from Snettisham southwards the coasting stream tends to turn more and more into SW movements on a standard direction across the mudflats and water". *(Cambridge Bird Report 1958 p.8).*

It is interesting to speculate on the origins and destination of these spectacular movements. Our understanding of the departure from the Wash has not improved a great deal since the 1950s. Those birds that had been observed heading out across the Wash at Hunstanton were seen to arrive at Freiston/Holbeach on the Lincs. side, while those that turned S at the cliffs either passed SW/WSW inland at Lynn Point, having crossed at Ouse Mouth or headed WSW inland at Nenemouth. Some birds certainly turned to W or NW along or parallel to the S.Wash shores and crossed the Welland Mouth to NW towards Frampton/Frieston. Thus the movements had become considerably more diffuse once the Wash had been traversed, and whilst the resultant passage inland was considerably more pronounced than the general movements over much of Britain they were in no way as impressive as those along the North Norfolk Coast.

The narrow passage along the Norfolk coast is of a considerably greater volume than that at inland Norfolk localities. Whilst this has generally been accepted as the accumulative result of birds arriving from the sea turning to travel WNW/W along the coast, this hardly explains the frequent westward coasting movements Cromer—Hunstanton of vast numbers of birds without any suggestion of additional birds joining the traffic from a more northerly quarter. This suggests that the arrival is already concentrated before it reaches the Norfolk coast and is simply an extended arm of a similar movement in Europe.

It is therefore tempting to look across the North Sea to the ENE to compare the similar E — W coastline of North Germany and North Holland in the region of the Frisian Islands where the great crossroads of flight lines from Scandinavia via Denmark and the route of Russian birds by-passing the Baltic Sea meet. This is an obvious stepping stone to Britain and one that would produce this conspicuous concentration if the shortest crossing to the west were made. In the sort of ideal weather conditions that coincide with the majority of these major movements in Norfolk, it would require a mere 4 —5 hours flying time or less to hit the East Anglian coastline.

Thus the movements along the North Norfolk coast could well be the result of the funnelling of birds that had passed down the coasts of the Baltic Sea and North Sea coasts of Scandinavia and come together along the North Coast of Germany.

As can be seen comparatively little recent data is readily available on immigration on the North Norfolk coast, certainly one of the major staging posts for such movements into Great Britain. A clearer picture of the arrivals East of Cromer would seem especially valuable and even the movements along the south coast of the Wash need researching further, more especially along the Lincs. coastline.

G.M.S. EASY

Bird Ringing *Report*

During 1978, ringers were active at all the established sites in the county, and this work should result in recoveries over the next few years. Recoveries notified during the year did include some spectacular movements including waders to and from South Africa, and a Starling to Italy, the third for the country and the second from Norfolk. But for the most part they added useful supporting information to the files. There were nice series of recoveries for some of the thrushes and finches, and quick movements of Swallow and Great Tit, due to operations at strategically placed ringing stations. The second Cetti's Warbler recovery came in 1978, though only a local one.

Other recoveries have come to light many years after ringing, more especially among the sea birds of course, and there are examples in this year's list of Oystercatcher, Sandwich Tern and Gannet. One or two passerines also lived to a ripe old age, including Redpoll and Brambling.

Where the terms have been used, pullus means a nestling and a control is a bird that is handled by a ringer when it already carries a ring put on elsewhere.

Gannet

Bass Rock, E. Lothian (pullus) 11.7.71 — Blakeney Pt., (freshly dead) 20.5.78

Canada Goose

Four found dead near Castle Acre after a storm on 3.1.78 had been ringed near Worksop, Notts., including two from July 1970 and July 1971.

Barnacle Goose

One of four on Wells Golf Course, 3.10.77, had been ringed as a juvenile on the Solway Firth in 1975, and had earlier been sighted in Norway, May 1977.

Brent Goose

Snettisham 21.12.76 — Dikson, Taymyr, USSR (killed), June 1977

Teal

De Koog, Texel, Netherlands 6.12.77 — Salthouse (shot), Dec. 1977

Oystercatcher

Heacham 5.9.67 — Vesteralen, Nordland, Norway 23.6.77

Knot

The first recovery in Britain of a Pretoria-ringed bird.

Langebaan, Cape, S. Africa 24.1.76 — Wolferton (control) 19.8.77

Sanderling

The first recovery in S. Africa of a British-ringed Sanderling, although an earlier movement in the reverse direction dates back to 1971 — *Norfolk Bird Report* 1972, p 24).

Heacham 17.5.69 (also controlled 1973, 1974) — Langebaan, Cape, S. Africa (control) 13.2.77

Woodcock

Joensum, Kuopio, Finland (pullus) 17.6.74 — Kelling (killed) 25.1.77

Holmsland, Jutland, Denmark 18.11.76 — Gillingham, 30.11.78

Black-headed Gull

Recoveries involved movements between Norfolk and Finland (3), Sweden (3), Estonia, Denmark (3), Poland, Germany (4) and Netherlands.

Common Gull

Matsalu, Estonia (pullus) 15.6.77 — Norwich (control) 19.1.78

Sandwich Tern

Note the age of the first of these.

Stiffkey (pullus) 28.6.59 — Clenchwarton (long dead) 13.7.75

Stiffkey (pullus) 22.6.67 — Esmoriz, Portugal 10.9.77

Puffin

Isle of May, Fife 13.5.77 — Holme (dead) 9.4.78

Kingfisher

Gillingham 26.8.77 — Mildenhall, Suffolk (dead) 17.11.78

Sand Martin

Tottenhill 16.7.77 — Huldenberg, Brabant, Belgium (control) 1.7.78

Swallow

In addition to the following, birds ringed at Happisburgh on spring passage in 1977 or 1978 were found in Bucks., Lincs. and West Yorks. in May 1978

Weybourne 30.8.77 — Watlington, Oxon. 28.8.78

Stuivehenskerke, Belgium 8.9.77 — Happisburgh (control) 13.5.78

Gibraltar Point, Lincs., 6.9.78 — Foulden Common (control) 22.9.78

Yellow Wagtail

This bird died after landing exhausted on a fishing vessel

Abingdon, Berks., 20.8.77 — off Wells, 22.4.78

Robin

A useful autumn passage record, and another that would have been more useful had the recovery details been more precise.

Castricum, Netherlands (juv) 6.10.78 — Waxham, (control) 15.10.78

Holme 8.10.73 — Adamuz, Cordoba Spain (trapped?) between 1975 and 1977.

Blackbird

The first-mentioned suggests overwintering in Sweden. Other recoveries were from usual localities.

Tunstead 8.2.76 — Floby, Skaraborg, Sweden (dead) 22.1.77

Titchwell 14.11.76 — Fair Isle (control) 6.11.77

Song Thrush

Holme 6.10.77 — Birkenhead, Cheshire (cat) 19.12.77

East Ruston 16.10.77 — Zavidovo, Kalinin, USSR 8.5.78

Redwing

Sheringham 17.10.77 — Foret de Cranou, Finisterre, France 21.1.79

Cetti's Warbler

The first recovery of a Norfolk-ringed bird.

Gillingham 22.4.78 — Oulton Broad (control) 28.10.78

Reed Warbler

Brandon, Coventry 18.9.77 — Gillingham (control) 18.6.78

Garden Warbler

Helgoland, Germany 16.6.75 — Gillingham (control) 5.7.77

Chiffchaff

Note the recovery date of this bird.

South Runcton 14.8.76 — Equerdreville, Manche, France (dead) 12.1.78

Willow Warbler

Christianso, Bornholme, Denmark 5.6.77 — Terrington (dead) 2.7.77

Bearded Tit

Other movements were recorded between Titchwell and Goole, Yorks. and Ratcliffe-on-the-Wreake, Leics.

Titchwell 9.7.78 — Rye Meads, Herts. (control) 26.11.78

Walberswick, Suffolk 16.9.78 — Weybourne (control) 23.10.78

Long-tailed Tit

Titchwell 25.10.78 — Grantham, Lincs. (road casualty) 18.11.78

Great Tit

Ingatestone, Essex 4.3.78 — Hunstanton (control) 30.3.78

Jackdaw

Bloemendaal, Netherlands 19.7.75 — Burgh Castle (killed) 29.3.77

Starling

The third British Starling to be recovered in Italy is given below. The first was also Norfolk-ringed (*Norfolk Bird Report* 1970, p 161). Other recoveries followed established patterns.

Downham Market 24.1.76 — Gropello Cairoli, Pavia, Italy 6.12.77

Tree Sparrow

Pitsea, Essex 30.10.76 — Easton, Norwich (dead) 3.9.77

Chaffinch

Cley 16.2.78 — Cuxhaven, Germany (dead) 30.3.78

Brambling

The first bird was ringed as a juvenile male, and was therefore seven years old on recovery.

Mintlyn, King's Lynn 11.12.71 — Kuusamo, Oulu, Finland (dead) 2.10.78
Herdla, Hordaland, Norway 9.11.75 — South Runcton (control) 28.12.77

Goldfinch

Sheringham 28.4.76 — Gamlingay, Cambs., 12.3.78
Westerschouwen, Zeeland, Netherlands 21.10.76 — Sheringham (control) 22.4.78
Navaro, Soria, Spain 8.3.78 — Sheringham (control) 4.5.78
Happisburgh 18.5.77 — Villagarcia de Arosa, Pontevedra, Spain (caged) 29.10.78

Siskin

These two recoveries make an interesting comparison.

Sheringham 18.4.76 — Crewe, Cheshire 10.3.78
Sheringham 18.4.76 — Sutton Coldfield, Warwicks 12.3.78

Redpoll

Given below are recoveries well to the south in France, and in Belgium outside the usual late autumn period.

Leziate, King's Lynn 2.9.72 — Ruiselede, W. Flanders, Belgium 6.7.78
Leziate 28.9.75 — Lommel, Limburg, Belgium 21.3.78
South Runcton 6.8.76 — Jambes, Namur, Belgium 2.1.78
South Runcton 27.12.77 — Loupes, Bordeaux, France 4.9.78

Classified Notes

These notes are based on Birds of Norfolk (revised edition 1977) where fuller details regarding status, distribution, migration and ringing recoveries may be found. Important records for Wisbech Sewage Farm (part of which is on the Lincolnshire side of the county boundary) have been selected from the files of Cambridge Bird Club. Fuller details of Fens records may be found in the Cambridge Bird Club Report for 1978.

The order used is that of Professor K. H. Voous (1977) List of recent Holarctic Bird Species. Observations refer to 1978, unless otherwise stated. To save space, all but the most essential initials have been omitted. Records are of single birds unless otherwise stated.

Red-throated Diver: North: Only interesting movement was 50 east off Sheringham Dec. 19th.

Black-throated Diver: North/East: Total of 21 coastal records up to March 5th and from Sept. 17th. Inland: Lound Feb. 4th—7th, Filby March 3rd and Claxton (dead) March 6th.

Great Northern Diver: North: Over 30 records up to May 13th and from Oct. 14th with unusual total of 5 off Cromer Jan. 5th. One in breeding plumage at Weybourne May 25th.

Little Grebe: Breydon: 10 - 15 breeding pairs in adjacent dykes. Wash: Peak of 64 Snettisham Nov. *All breeding records requested.*

Great Crested Grebe: Breeding season adult counts include: Earsham 2, Lound 10, Haddiscoe G.P. 2, Costessey G.P. 4, Hardley 2. Peak of 38, Breydon Aug. 9th; 44 adults and 9 immatures River Yare between Reedham and Thorpe Sept. 3rd.

Red-necked Grebe: North Holme March 5th, 14th; Hunstanton Jan. 1st, Feb. 6th, 18th, 3, March 1st, Oct. 23rd; Scolt Head May 27th (in summer plumage); Cley May 4th, Sept. 12th, Nov. 28th; Sheringham Nov. 19th,; Titchwell 2, Dec. 3rd and Morston Pits Dec. 19th. East: Winterton Oct. 15th, Nov. 26th, Dec. 3rd and River Bure at Yarmouth Nov. 12th.

Slavonian Grebe: North: Holme Feb. 27th, April 8th, 2 on 15th, Oct. 18th, 22nd; Hunstanton Jan. 2nd, 5th, Feb. 6th, 18th, 26th, 3 on March 1st, 4th, 5th, 24th, 2 on April 16th; Sheringham Nov. 26th, Titchwell Feb. 1st, 2 on Dec. 3rd; Cley - Salthouse Jan. 4th, Oct. 15th, Nov. 19th and 27th; Wells 2 on Nov. 5th; Holkham 2 on Oct. 21st, 3 on 30th. Wash: Snettisham Feb. 18th - March 12th. East: Bacton Feb. 25th and Breydon 2 on Jan. 14th. Broads: Filby Dec. 1977 to Jan. 26th.

Black-necked Grebe: North: Titchwell Feb. 14th, Nov. 17th - 20th, Dec. 3rd; Hunstanton March 1st, 12th; Cley - Salthouse Feb. 25th, Nov. 27th - 28th. Wash: Snettisham Feb. 22nd - March 14th. Fens: Wisbech S.F. Sept. 17th - 24th.

Fulmar: North: Total of 38 young between Weybourne and Cromer, as follows: Weybourne to Sheringham 21, Sheringham to West Runton 5, West to East Runton 2, East Runton to Cromer 10. At least 19 occupied sites West Runton Gap to East Runton in May. Sheringham present until Sept. 15th and from Oct. 26th; largest count 71 April 9th. Wash: Hunstanton, build up up in Jan.. to over 50 pairs; 18 young on ledges in summer, first young leaving Aug. 27th. First birds returned Oct. 28th. East: Present again at Bacton but nesting uncertain. Happisburgh 4 pairs from Feb. 28th and 2 pairs nested - one chick raised. Blue-phase birds at Sheringham March 16th - 18th, April 30th - July 13th, Aug. 17th - 28th, Nov. 28th, Dec. 16th; Weybourne Dec. 16th.

Cory's Shearwater: North: Cley Aug. 30th (SDE) 2, Cley Sept. 2nd (GED, SCJ) and Salthouse Sept. 7th (AMH). East: Winterton Aug. 30th (PRA).

Sooty Shearwater: North: Cley - Salthouse Aug. 14th, 6 on 25th, 5 on 26th, 27th, 28th, 5 on 30th, Sept. 1st, 2 on 18th, 30th, 3 on Oct. 1st. Hunstanton Sept. 30th, 2 on Dec. 31st. Holme 3 on Aug. 30th. Mundesley Sept. 11th. Sheringham Aug. 13th, 4 on 26th, 2 on Oct. 1st. East: Winterton 57 north in 3 hours Aug. 26th, 27th, 4 on 30th, 4 on Sept. 12th and 39 Oct. 1st (PRA).

Manx Shearwater: North: Cley-Salthouse 2 Feb. 17th, May 27th, June 8th, 2 on 10th, 4 on Aug. 27th, 3 Sept. 15th, 2 on 16th, 3 on 17th, 11 on 18th, 4 on 30th; Cromer Oct. 17th; Sheringham May 28th, 3 on June 10th, 11 on 17th, 25 on July 1st, 7 on Aug. 1st, 26 on Sept. 30th; Holme March 15th, 7 Sept. 9th, 17th, 18th, 10 on 19th; Hunstanton 3 on Sept. 17th; Blakeney Point Sept. 12th; Titchwell 10 on July 2nd. East: Winterton 6 March 16th, 2 on Sept. 14th and 2 on Oct. 1st. Wash: Snettisham 2 on Sept. 17th. Birds of the Balearic race Winterton Oct. 1st; Cley Aug. 29th and Weybourne Sept. 18th.

Storm Petrel: North: Sheringham 2, Sept. 30th.

Leach's Petrel: North: Cley Sept. 29th, 30th, Oct. 1st, 4th; Blakeney Point June 12th, Sept. 30th; Sheringham 4 Sept. 30th and Oct. 1st. East: Winterton 2 - 3 on Oct. 1st.

Petrel species: North: Holme Sept. 25th and Cley on 30th.

Gannet: North: Sheringham 540 Oct. 1st and 400 previous day. East: Winterton 224 south in 3 hours Sept. 30th; similar number Oct. 1st.

Cormorant: Broads: Ranworth Inner 187 Jan. 13th. Wash: Snettisham 25 in Oct. North: Holkham Park 84 in one tree Nov. 13th 1977.

Shag: N/E Coasts: Maxima of 4 at Snettisham Sept. 14th - 23rd and at Winterton Dec. 17th. Broads: Filby Nov. 27th. Brecks: Thetford mill pond March 11th 1977.

Bittern: Broads: 6 regular boomers compared with 7 in 1977. North: Cley one pair bred successfully.

Little Bittern: North: Cley female Aug. 5th - 6th (FME, SCJ, ERP *et al*).

Little Egret: East: Winterton one south Aug. 3rd (BC, MF).

Grey Heron: The following heronries were counted: *Borders of Wash:* Snettisham 16. *Brecks:* Didlington 8 and Shadwell 8. *Fens:* Hilgay 31 and Islington 59. *Broads:* Buckenham 14; Ranworth 7; Strumpshaw one and Halvergate Engine House Carr one (new site). *Central:* Keswick one and Colney Hall 2. Neither Narford nor Denver Sluice occupied.

Purple Heron: Wash: Snettisham area Aug. 25th - 26th (SE, LE, MPL *et al).* Additional 1977 record = East: Waxham Sept. 25th (RAB).

Black Stork: North: Cley April 28th (MPL).

Spoonbill: North: Cley, singles and parties up to 8 May 10th - Aug. 8th; on July 29th 6 left Cley in easterly direction at 10.30 and 6 arrived Minsmere at 13.15; Holme 5 west July 25th and one east Sept. 2nd. East: Breydon one May 23rd - 24th and 2 on 26th; Winterton April 22nd. Broads: Hickling up to 4 between June 8th - July 19th; Hardley flood May 13th.

Mute Swan: BTO census gave a county total of 1,035, including 137 breeding pairs.

Bewick's Swan: Recorded up to May 14th and from Oct. 1st. Largest concentration at Welney where 1,900 in Jan. and 1,100 by year end. 102 present on Lower Bure March 18th/19th including a Slimbridge-dyed bird, 26 March 26th and last 9 April 1st. Large numbers Breydon/Lower Bure where 130 arrived Dec. 14th and 148 there on Dec. 28th; Burgh Castle marshes 62 April 8th; Ranworth Inner Broad 46 roosting till Feb. 19th; 84 near Fleggburgh Common Dec. 26th 1977 to Jan. 6th and up to 73 near Muck Fleet from Nov. 5th roosting on Little and Filby Broads; Haddiscoe Levels 41 March 3rd; Rockland Broad 42 Dec. 30th; Hardley Flood 18 Dec.31st; Hickling 94 March 17th, 19 on Oct. 22nd. Brecks: Fowl Mere 3 Nov. 26th and 2 Dec. 25th - the only records. North/Wash: Maxima of 52 Cley Dec. 6th and 26 Snettisham Dec. 26th. Easterly exodus noted at Gillingham (37 March 5th) and at Chedgrave (30 March 6th).

Whooper Swan: Recorded up to April 11th and from Sept. 18th at usual haunts with largest herds at Welney where 72 in Jan., 80 in Feb., 56 in March and 90 by year end. Broads: Hickling 35 Dec. 14th.

Bean Goose: East: Up to 96 in usual area till Feb. 26th and last 23 March 1st. First returned Nov. 30th, 61 by Dec. 2nd increasing to 72 by 26th. North: Holkham 2 - 3 Feb. 7th to March 4th.

Pink-footed Goose: East: Breydon 24 Jan. 3rd - the only party of note. Wash: Snettisham record 4,540 Jan. 2nd after which high winds dispersed them and only 640 thereafter. Last birds 68 Feb. 22nd. 13 returned Oct. 16th and maximum of 2,370 Dec. 26th. A severe storm with lightning Jan. 3rd killed many Pink-feet and Canada in west Norfolk; *full details will appear in the next report.* North: Brancaster 250 Jan. 9th; Holkham 21 on Jan. 10th and 70 Dec. 16th; Holme Sept. 6th, an early date; 180 there Jan. 9th and 150 Feb. 1st.

White-fronted Goose: East: Yare Valley peak of 56 Feb. 18th with 54 remaining until March 5th. 13 still present on 9th, 7 Dec. 10th increasing to 16 on 26th; Horsey 13 Jan. 10th - 13th; Winterton 18 north Dec. 31st. Broads: Hickling 11 Jan. 17th, 22 on 21st and 24 on 26th. North: Holkham 75 Jan. 9th, 93 on 23rd, 60 Dec. 11th and 117 by 24th. Fens: Welney 17 Jan. 25th, 7 March 10th, 4 Dec. 30th.

Barnacle Goose: East: Hassingham Dec. 26th; Winterton 11 south Dec. 14th. North: Cley 5 March 24th - April 9th, one Nov. - Dec. 8th; Salthouse 3 Jan. 22nd; Wells Dec. 11th; Holme 4 Jan. 4th. Wash: Snettisham Feb. 6th/7th and Nov. 26th with Pink-feet, also 2 Dec. 12th - 14th; Hunstanton 2 Dec. 22nd. Fens: Welney Dec. 30th.

Brent Goose: Maximum numbers at regular localities: Breydon 15; Salthouse over 2,000; Blakeney 1,000; Scolt Head 1,200; Hunstanton - Holme 600; Snettisham 1,415 and Terrington Marsh 580. Unusual numbers offshore at Sheringham Oct. 1st when 711 west and Nov. 25th when 1,638 west. At Winterton 431 north in 5 hours Oct. 1st. Yarmouth 467 north in 3½ hours Nov. 28th. East: Yare Valley 22 Jan. 3rd.

Egyptian Goose: Recorded at 28 localities.

Ruddy Shelduck: East: Breydon pair Oct. 1st - 4th with drake again on 8th. Broads: Hoveton Great 2 end Aug. to 13th Sept. North: Gunton Park Nov. 12th and pair Sept. 25th; Cley 2 Aug. 20th - 28th.

Shelduck: Wash: Ouse Mouth 2,295 Jan. 28th; Snettisham maximum of 2,426 in Feb. and 1,912 in Dec. East: Breydon peaks of 866 Feb. 10th and 682 Dec. 19th. Breeding records include single pairs at Aldeby and Flitcham, two pairs at Cockshoot Broad (where one pair previous two years) and Hoveton Great Broad, 4 pairs in straw stack West Winch and 7 pairs Stanford Water; at Hardley Flood 92 young mid-July. North: Sheringham 453 west Oct. 1st and 650 west Dec. 30th.

Mandarin: East: Smallburgh female June 9th; Winterton pair April 22nd. Central: Coston G.P. pair Aug. 17th. North: Cley March 25th; Holkham Feb. 28th and May 16th/17th.

Wigeon: Fens: Welney 12,700 in Jan. and 11,000 by year end. East: Strumpshaw 2,000 Jan. and 3,000 in Feb.; Yarmouth impressive movement offshore Dec. 30th - 1,981 north and 1,707 south in two hours. North: Sheringham total of 7,300 west Dec. 30th.

Gadwall: Brecks: Largest counts 400 - 500 Stanford Water Aug. 31st, 57 Fowlmere Feb. 4th, 48 Micklemere Nov. 26th. At West Acre an unusual breeding record of successful nesting on top of water wheel. Wash: Snettisham 48 Dec. 22nd. North: Gunton Park 480 Sept. 20th. Broads: Martham 41 Feb. 11th.

Teal: Fens: Welney 1,000 in Jan. East: Hardley Flood 634 Dec. 10th.

Pintail: Fens: Welney maximum of 850 in Jan. North: Cley 150 Dec. 12th and 100 Feb. 9th. East: Breydon 148 Feb. 19th, pair till May 27th and female till June 8th; Buckenham 30 Jan. 31st; Cantley Aug. 6th - 13th.

Garganey: Spring arrival from April 4th (Wiveton), subsequently at Narford, Hardley, Holkham, Hickling, Cley, Wells, Wiveton, Wisbech S.F. (11 end Aug.), Kelling, Cantley and Ranworth.

Blue-winged Teal: East: Cantley drake in eclipse Aug. 6th - Oct. 4th; also at Hardley from Aug. 14th - Sept. 27th (PRA, ADB *et al*). Fens: Welney drake March 5th - 12th (WT); Wisbech S.F. 2 Sept. 11th - Oct. 8th (JM, JBK, GMSE, CAEK).

Shoveler: Fens: Welney maximum 540 in Jan; Wisbech S.F. 90 Aug. 25th. Wash: Snettisham 32 Dec. 29th. East: Hardley Flood 100 Aug. 14th. Broads: Filby 45 Feb. 11th and 42 on 26th.

Red-crested Pochard: North: Cley pair Nov. 17th (MPT).

Pochard: Few breeding records submitted. Fens: Welney 500 in Jan.

Ring-necked Duck: Broads: Ranworth drake March 9th (DB).

Tufted Duck: Breeding records: 25 pairs at 9 sites in Brecks but doubtless others; elsewhere (including Welney and Salthouse) a minimum of 16 pairs at 6 sites.

Scaup: Wash: Snettisham maximum 15 Dec. 31st.

Eider: Coastal records throughout year. Largest flocks for main localities appear below: East: Yarmouth/Gorleston 17. North: Titchwell/Thornham 200; Holme 37; Scolt Head 115. Wash: Hunstanton 50 and Snettisham 28.

Long-tailed Duck: Wash: Hunstanton monthly maxima: Jan. 4, Feb. 2, March 10, April 16, Nov. 1 and Dec. 30. North: Occasional records of up to 13 until April and from Sept. 19th.

Common Scoter: Fens: Wisbech S.F. drake Oct. 14th; the only inland record.

Velvet Scoter: Wash/North: recorded Jan. - Feb. and from Oct; maximum 11. East: Up to 15 off Gorleston, Yarmouth, Sea Palling and Happisburgh until Jan. 14th and from Aug. 26th.

Goldeneye: Maxima as follows: Wash: Snettisham 53 (March) and Hunstanton 26 (Jan.). Broads: Filby 23 (Feb.)

Smew: Singles (and once 3) up to March 3rd at Breydon, Colney G.P., Rollesby and Ranworth Broads and Snettisham. At year end duck Ranworth Dec. 17th.

Red-breasted Merganser: Wash /North: Largest numbers include 28 Snettisham and 36 Hunstanton. East: Winterton 16 Oct. 27th.

Goosander: Winter records at 8 localities including 29 Gunton Park.

Ruddy Duck: Central: Drake Lyng Easthaugh G.P. July 9th (NM). Third county record. Additional 1977 record: North: Cley/Salthouse one on sea Jan. 30th (AB, RWSK).

Honey Buzzard: North: Two at one site from May 29th, but no proof of nesting. Broads: How Hill Sept. 10th - 20th observed digging out a wasp's nest. Further reading: 'Honey Buzzard at wasp's nest' by F.K. Cobb *(British Birds* 72 pp 59-64: an account of the bird at Holkham in Oct. 1976.

Black Kite: 1976 records: Holkham Gap Oct. 12th (FAW) and Holkham Park Oct. 17th (TMD). These observations may well relate to one individual.

Red Kite: North: Northrepps Dec. 12th (KMN) and Weybourne - Kelling - Cley on same date (MPL, MPT, SRB). Central: Oxnead - Buxton area Feb. 5th - 6th (JRW *et al).*

Marsh Harrier: Eight pairs bred at 6 sites rearing 18 flying young.

Hen Harrier: Recorded at 40 sites up to May 9th (Lound) and from Oct. 2nd (Hickling & Cley). At end of year widespread especially in Dec. when 5 at Strumpshaw, 5 Scolt Head/Brancaster area, 3 Holme, 4 Roydon Common, 3 Titchwell and 3 Rackheath. Full list of localities in 1978/9 winter will appear in next Report.

Montagu's Harrier: A pair bred successfully rearing 3 young. Elsewhere only at Horsey (female for several weeks), Weybourne June 28th and Hickling May 22nd.

Goshawk: Brecks: 2 March 25th (JBK) and one with jesses Nov. 26th (CAEK).

Sparrowhawk: Recorded at 41 sites, but not a single breeding record.

Buzzard: North: Brancaster Common Oct. 21st and Titchwell May 23rd. Central: Tuddenham July 15th. East: Breydon April 15th; Winterton - Horsey Gap March 3rd, 31st, April 16th; Fritton 2, March 20th; Briggate April 16th.

Rough-legged Buzzard: North: Wells/Holkham Nov. 4th - Dec. 17th; Thornham Nov. 20th; Scolt Head Nov. 12th; Burnham Overy/Overy Staithe Nov. 16th and 28th; Holme and Old Hunstanton Nov. 4th. Wash: Snettisham Nov. 28th, Dec. 2nd. East: Winterton - Horsey Gap Nov. 2nd, 5th and 2 on 8th; Burgh Castle March 3rd. Brecks: Gooderstone Nov. 26th.

Osprey: Recorded at 22 sites between April 5th (when one in off sea at Happisburgh) and Aug. 26th.

Red-footed Falcon: East: Winterton female July 25th (BC). Additional 1976 record: Holkham male May 30th (SCJ, NW).

Merlin: Recorded at Winterton, Hickling, Ormesby, Sea Palling, Scolt Head, Cley, Roydon, Hunstanton, Holkham, Wells, Snettisham, Kelling, Horsey, Sheringham, East

Cranes were seen in March and in Aug. — Sept.

Somerton, Holme, Brancaster and Blakeney Point up to May 22nd and from Sept. 19th. Mainly singles but 3 Scolt Head and 4 Roydon.

Hobby: North: Titchwell May 2nd, Holme Oct. 10th, Scolt Head May 6th and Brinton July 27th. East: Breydon May 1st, Filby Broad May 20th, Lound May 9th, Strumpshaw July 9th, Happisburgh April 28th. Brecks: Weeting July 29th and Stanford May 31st.

Peregrine: North: Titchwell Feb. 23rd; Hunstanton Jan. 31st; Runton April 2nd; Scolt Head early in year; Ringstead Downs Jan. 31st. East: Fritton April 1st (with jesses); Winterton April 24th; Strumpshaw Sept. 8th (with jesses). Wash: Snettisham Feb. 21st. Fens: Wisbech S.F. The escape from 1977 present in the autumn.

Quail: Calling during summer between Brancaster and Burnham Market in same area as 1977. Wolferton - Lynn June 3rd.

Golden Pheasant: Recorded at Two Mile Bottom, Thetford Warren, Swaffham Heath, Shadwell, Hockham, Thompson, Santon Downham, Bodney, Wolferton, Fowl Mere, Brandon, St. Helen's Well, Foulden and Sandringham.

Spotted Crake: Fens: Wisbech S.F. Aug. 15th and Sept. 20th.

Crane: North: Holt - Thornage - Bayfield area March 6th - 26th. Fens: Welney Aug. 8th to Sept. 27th (DA, LS *et al*).

Oystercatcher: Records of breeding pairs include: East: Breydon 8. Broads: Horsey 3. North: Blakeney Point 180, Stiffkey Binks 23, Wells 9, Bob Halls Sands 4, Overy Shingle Bank 6, Scolt Head 160 (only 30 young fledged) and Brancaster GC 6. Wash: Snettisham 10, and Terrington Marsh Trial Bank 3. Inland records of breeding, both in fields of sugar beet at Flitcham and Hardley. Maximum counts at Snettisham 12,100 Jan. and 12,700 Sept., with 1380 present in late June. Further reading 'Origins and Movements of Oystercatchers on the Wash' *(British Birds* 77, pp 439 - 447).

Avocet: North: Cley winter records Jan. 1st, 7th and Feb. 5th. First breeding pair had returned March 4th. First egg hatched April 30th. Total of 5 pairs reared 17 young. Last recorded Oct. 17th. Wash: Snettisham 1 - 2 April 27th - June 19th; mating noted in mid-May but did not breed. Non-breeding records: East Breydon Jan. 10th - Feb. 26th, April 27th and Nov. 13th. Broads: Hickling 2 June 10th. Fens: Wisbech SF Aug. 20th.

Stone Curlew: Recorded from March 18th at Breckland breeding sites. Only other record Winterton Aug. 4th.

Little Ringed Plover: Extreme dates March 13th (Cantley) and September 11th (Holme). 15 breeding pairs at 10 localities. Maximum counts 6 Hickling July 25th and Aug. 19th, 16 Cantley Aug. 6th and 4 Wissington BF Sept. 9th.

Kentish Plover: Although mating was observed at one site and two scrapes made, the pair was driven off by resident Ringed Plovers. East: Breydon total of 10 individuals April 14th - May 28th, Winterton July 26th. Broads: Hickling Aptil 9th, 21st, June 1st and 2 on 14th. North: Cley/Salthouse April 11th - May 21st, with 2 April 13th and 30th. Blakeney Point early June.

Dotterel: North: Cley 4 April 29th. Brancaster July 17th and Sept. 21st.

Golden Plover: Counts of four figures at Garboldisham April 10th (3000), St. Benets Level March 11th (2500) and Wickhampton Marshes Dec. 26th (1000).

Grey Plover: Monthly counts at Snettisham included Jan. 164, May 440, Aug. 900 and Oct. 180. At Breydon Spring peak 51 May 21st and 20 in breeding plumage June 15th/16th. Inland 5 Wisbech SF Sept. 24th.

Knot: Maximum counts for each winter period at Snettisham 21000 March and 25000 Dec. Inland = 6 Wisbech SF Aug. 28th, 7 on 30th and 1 - 3 early Sept. Hardley Flood April 29th.

Sanderling: Maximum count of 600 Snettisham in Aug. Inland = Wisbech SF May 21st and Aug. 25th and Hardley Flood May 16th.

Little Stint: Single at Cley Feb. 17th. *Spring:* East: Breydon May 8th, 26th and June 6th. Hardley Flood 3 May 18th. Broads: Hickling April 22nd, May 27th/28th. North: Cley March 25th, May 9th. 2 June 1st and 7 on 13th. Fens: Welney April 28th. *Autumn:* an unprecedented influx in the first half of September with maximum counts of 157 (250 estimated to be present) Wisbech SF Sept. 14th, 100 Cley Sept. 10th and 15th, 58 Hickling Sept. 12th, 23 Cantley Sept. 11th and 20 Breydon Sept. 6th. Elsewhere reported from Wissington BF, King's Lynn BF and Snettisham, while 27 flew west at Holme Sept. 6th, where 3 were still present until Nov. 13th.

Temminck's Stint: East: Breydon Sept. 17th (the first record from this locality for thirty years), Cantley BF May 12th and Hardley Flood May 30th. Broads: Hickling May 21st, 25th, 27th/28th, 2 on 29th, singles June 10th, July 25th, Sept. 4th, 2 on 6th and 1 on 8th. North: Cley May 11th, 13th, 19th - 25th, Aug. 2nd - 14th, with 2 on 6th. Fens: Wisbech SF Oct. 17th until early Nov.

White Rumped Sandpiper: East: Breydon July 30th - Aug.7th. (PRA, DJH).

Pectoral Sandpiper: Broads: Hickling June 8th - 12th (SEL, DJM,DM) and Sept. 30th (SEL).

Curlew Sandpiper: Spring records from Breydon May 12th, 2 on 14th and 18th, and single on 21st, Hickling June 4th and Cley May 13th and 27th. Well marked autumn passage with a few at end of July and main influx commencing in last ten days of Aug., building up to a peak in early Sept. Maximum counts at each locality: 17 Hickling Aug. 21st, 56 Breydon, 20 Titchwell, 75 Thornham Point and 195 flying east Holme, all on Sept. 6th, 100 Cley on 7th, 150 Wisbech SF on 9th, 13 King's Lynn BF on 10th and 21 Cantley BF on 17th. Last 2 birds of autumn recorded at latter locality Oct. 7th.

Purple Sandpiper: In first winter period only recorded at Winterton Jan. 2nd, Hopton Feb. 14th/15th and Hunstanton 3 Jan. 4th and 4 March 6th. Late spring record Titchwell May 21st. Autumn passage from Aug. 10th, with 1 - 3 recorded at Winterton, Sheringham, Salthouse, Cley, Blakeney Point, Thornham Point, Titchwell and Snettisham. In second winter period up to 4 Yarmouth/Gorleston, 7 Hunstanton and 4 Heacham, with 4 flying NW Happisburgh Nov. 26th.

Dunlin: Wash: Maxima at Snettisham 12,000 in Aug. and 10,000 in Dec.

Broad-billed Sandpiper: East: Breydon May 5th - 8th (PRA *et al*). Wash: Wolferton trapped and ringed Sept. 16th (JG, PLI, PI).

Ruff: Impressive winter total of 280 at Welney in Jan.; elsewhere 40 Downham Market Jan. 15th and 24 Hickling Feb. 2nd. Present at Welney in spring but no display seen. Four parties totalling 28 birds east at Sheringham April 23rd and 34 west Aug. 17th. Maxima in autumn 200 Wisbech SF Aug. 18th/19th and 60 Cley Aug. 2nd and 28th.

Jack Snipe: Extreme dates May 13th (Tottenhill GP) and Sept. 14th (Winterton).

Snipe: Concentration of 600 Wisbech SF Sept. 9th.

Woodcock: Roding birds reported at Brettenham, Briston, East Ruston, East Tuddenham, Great Carr, Lynford, Marsham and Weeting Heath, while adult with 4 young Swanton Abbot.

Black-tailed Godwit: Breeding season: Fens: Welney 5 pairs reared young. North: Cley 2 pairs, hatching a total of 4 chicks. At a third site, a pair present during May. Autumn groups included 21 Hickling, 17 Holme and 22 Snettisham. Single winter record of one at Breydon until end of the year.

Bar-tailed Godwit: Wash: Maxima at Snettisham 3,900 in Jan., 5,500 in Feb., 2,850 in Sept. and 3,100 in Dec.

Whimbrel: Extreme dates April 20th (Breydon) and Oct. 11th (Thornham Point).

Spotted Redshank: Winter records only from Cley with 2 Feb. 19th and single on 24th. Concentrations of 40 Cley April 26th; in autumn 55 in August and 42 in Sept. at Snettisham. Late birds, 4 Cley Nov. 18th.

Redshank: Wash: Snettisham maximum 1,538 in Oct.

Greenshank: Recorded from April 27th, with spring maximum of 8 Breydon May 11th. Autumn maxima 22 Snettisham Aug. 17th with 21 on 9th and 19 Wisbech SF on 16th. December records of singles at Thornham on 3rd, Wells 3rd - 13th and Tichwell on 25th.

Green Sandpiper: Winter birds reported from east at Limpenhoe, Halvergate, Breydon and Buckenham. Autumn maxima at Cantley where 32 July 30th and 31 Aug. 12th, including a single party of 26.

Wood Sandpiper: Spring records of 1 - 2 birds from Breydon, Hickling, Hardley Flood and Cley. Autumn reports from Breydon, Cantley, Hickling and Cley; maximum of 12 Wisbech SF Aug. 9th and 16th.

Terek Sandpiper: East: Breydon July 5th (PRA).

Common Sandpiper: East: Breydon Jan. 1st - March 17th and Dec. 18th.

Turnstone: Inland records at Hardley Flood April 23rd and Welney May 1st.

Red Necked Phalarope: North: Cley Aug. 19th, 23rd and Sept. 4th. Holme Aug. 24th - Sept. 2nd. Fens: Wisbech SF Aug. 27th - Sept. 1st.

Grey Phalarope: East: Winterton Oct. 1st. North: Cromer Jan. 12th. Cley Sept. 30th. Wash: Hunstanton Oct. 23rd.

Pomarine Skua: East: Winterton 4 Aug. 11th, 31st, 4 Sept. 5th and one Oct. 17th. North: Sheringham/Weybourne/Cley: singles on four dates from Aug. 23rd with 4 Aug. 29th, 4 on 30th, 2 Sept. 18th, 9 on 30th,2 Oct. 17th and 2 Nov. 26th. Elsewhere, Cromer Aug. 9th, Blakeney Point Aug. 21st and Sept. 16th, Holkham 3 Oct. 17th,

Scolt Head 2 Aug. 27th and 2 Sept. 2nd, Holme Sept. 4th, 19th, 23rd, 25th and 11 Nov. 26th. Inland one Briston, Nov. 30th, in weak state and later died.

Arctic Skua: Hopton, sick bird April 18th was the only spring report. Three June records: Blakeney Point 12th, 2 Winterton 14th and Cley 17th. Main autumn passage from early Aug., with maxima for each area: East: Winterton 35 Aug. 27th and 26 Sept. 30th. North: Cley 40 Aug. 6th, 70 on 28th, 50 on 29th and 50 Sept. 17th. Sheringham 50 Aug. 8th. Holme 35 Aug. 30th, 37 Sept. 4th, 47 on 19th and 50 on 30th. Wash: Hunstanton 41 Aug. 30th and 47 Sept. 17th. Terrington 19 Sept. 30th, Snettisham 10 Aug. 7th. 2 late birds Gorleston Nov. 28th. Single inland record Reepham Sept. 17th.

Long-tailed Skua: North: Holme Aug. 30th (PRC) and Cley juvenile Sept. 16th (GS). Additional 1977 records: Holme July 19th (PRC) and Snettisham Sept. 17th (GMSE).

Great Skua: Three June records: Cley 12th Winterton 16th and Sheringham 17th. Autumn passage from end of July. Maxima at main localities: East: Winterton 9 Oct. 1st. North: Cley 17 Sept. 30th. Weybourne 10 Sept. 15th. Sheringham 4 Sept. 15th. Titchwell 6 Oct. 17th. Holme 50 Sept. 19th, 40 on 29th, 125 on 30th, 28 Oct. 17th, 12 Nov. 26th. Wash: Terrington 23 Sept. 30th. A remarkable gathering of 120 was noted 60 miles NE of Yarmouth on Aug. 26th. December records from Winterton 16th, Holme 17th and Sheringham 16th.

Mediterranean Gull: East: Breydon, adult March 22nd (PRA). Yarmouth adult Sept. 2nd - 8th and Dec. 12th (PRA). North: Cley adult July 11th (RHH). Scolt Head adult Oct. 30th (PWA).

Little Gull: At an East Norfolk locality a pair of adults displaying from late May. Nesting began in first days of June, but unfortunately clutch of 3 eggs found on 16th failed to hatch. Recorded in Jan. at Cromer on 12th and 3 Weybourne on 30th. Well marked spring passage from April 3rd with up to 8 at Hickling, Breydon, Colney GP, Welney, Snettisham, Cley, Hunstanton, Filby Broad and Hardley Flood. At Hillington 15 adults in breeding plumage were present April 23rd with 20 at Titchwell May 10th. Mid-summer records from Breydon, Cley and Hickling, with up to 12 at latter locality. Maxima in autumn 274 flying NNE at Winterton Oct. 2nd and 50 Cley Oct. 11th. Unusual number of Dec. records with up to 7 at Cromer, Holme, Snettisham, Wolferton and Happisburgh, and 102 at Yarmouth and 43 flying east at Sheringham on 6th and 15 Cley on 16th.

Sabine's Gull: East: Winterton immatures Aug. 26th and Oct. 16th (PRA). Caister adult Aug. 27th (PRA). Yarmouth immature Oct. 1st (PRA, ADB). North: Holme/Thornham adult Aug. 30th, immature Sept. 4th, up to 2 adults Sept. 10th - 25th. (many observers). Titchwell Sept. 23rd (JDG, JEG).

Common Gull: North: Blakeney Point 2 pairs nested, one pair rearing 2 young.

Lesser Black-backed Gull: North: Blakeney Point one pair bred, raising single young. First breeding record for the County.

Iceland Gull: North: Cromer Nov. 23rd (MPL).

Glaucous Gull: In first winter period recorded in East at Winterton Jan. 26th, Yarmouth Feb. 16th, Gorleston March 5th and Breydon April 5th. In North records of singles from Holkham Jan. 10th and 16th, Scolt Head Jan. 11th and Cley/Weybourne/Sheringham area regular adult up to March 11th, with 3 Cley Jan. 1st one west Sheringham April 16th and Wells April 9th. Wash: Snettisham March 8th. Inland, immature Strumpshaw Jan. 4th - 6th. In the second winter period, regular adult returned to Cley area Aug. 18th and was joined by 2 others Oct. 14th - 18th. Elsewhere, singles at Yarmouth, Breydon, Winterton, Happisburgh, Holme and Hunstanton, with 2 Wells Nov. 28th and 2 Heacham Tip Dec. 29th.

Ivory Gull: North: Brancaster/Burnham Overy/Holkham immature Jan. 5th - 9th (KG, PRC *et al*). First county record.

Sandwich Tern: Extreme dates March 25th (Scolt Head) and Nov. 24th (Cley). North: Blakeney Point 3,000 breeding pairs reared 1,500 young and Scolt Head 2,100 breeding pairs reared 1,800 young.

Roseate Tern: North: Cley July 24th (JBK). Blakeney Point Sept. 20th (ECN).

Common Tern: Extreme dates April 21st (Cley) and Nov. 2nd (Breydon). Late 'comic terns' Wells Nov. 9th and Sheringham Dec. 30th. Breeding: Number of pairs (with number of fledged young in brackets where known). East: Breydon 25 (21). Broads: Hoveton Great 4, Hardley Flood 23 (11), Martham 2 (0), Ranworth 22 (40), Ormesby 3 and How Hill 2. North: Salthouse 2 (3), Cley 22, Blakeney Point 950 (120), Stiffkey Binks 46, Bob Halls Sands 32, Overy Staithe 2, Thornham Point 2 and Scolt Head 300 (35). Central: Lyng Easthaugh GP 5 (7). Wash: Snettisham 75 (35).

Arctic Tern: Extreme dates April 16th (six at Welney) and Oct. 17th (Winterton). Breeding: North: Blakeney Point 2 pairs reared 2 young; Scolt Head one pair bred unsuccessfully.

Little Tern: Extreme dates April 21st (Breydon) and Sept. 16th (Cley). Breeding: Number of pairs (with total of fledged young in brackets where known). East: Winterton 2 and Horsey 2. Broads: Hickling 41 (85 young hatched but only 30 reached flying stage). North: Blakeney Point 130 (very few young), Stiffkey Binks 30, Bob Halls Sands 15, Overy Shingle Banks 3, Wells 3, Thornham Point 20 (15), Titchwell 25, Scolt Head 65 (7), Brancaster 14 and Holme one. Inland: 2 Colney GP April 22nd and 3 Lyng Easthaugh GP Aug. 6th.

Black Tern: First at Cley April 24th, 1 - 2 April 28th/29th at Hickling, Martham Broad, Horsey Mere, Hardley Flood and Overy Staithe. More widespread in May but numbers low with maxima of 7 Colney GP, 8 Lyng and 11 Welney on 17th and 7 Hardley Flood on 28th. Autumn passage from end of July with maxima of 12 Wells Aug. 1st; 13 Blakeney Point Aug. 22nd; 12 Wisbech SF Sept. 6th; and 9 Thornham Point; 12 Sheringham and 25 Cley Sept. 7th. Latest Cley Oct. 1st.

Guillemot: North: Sheringham 140 east on June 17th is largest number recorded.

Black Guillemot: North: Salthouse Nov. 5th.

Little Auk: North Sheringham (dead) Jan. 4th, Feb. 25th, March 3rd and April 9th, with one alive Jan. 4th. Holkham (dead) Jan. 16th, Cley (dead) Jan. 15th, Salthouse (dead) on 21st. East: Happisburgh Jan. 12th. Inland casualties: Coltishall Dec. 28th and Beechamwell Jan. 13th.

Puffin: North: Cley - Salthouse April 13th (dead) May 27th, Sept. 20th and 30th; Weybourne Jan. 12th, 4 on Dec. 16th; Sheringham 2 May 27th, 2 June 18th, Sept. 15th, Nov. 25th, Dec. 9th and 6 Dec. 16th; Holme 3 Sept. 7th and 2 Nov. 26th; Holkham (dead) Jan. 15th. Wash: King's Lynn 10 exhausted birds tended by RSPCA during Jan. with singles Dec. 7th and 31st. East: Winterton 2 Oct. 7th.

Ring-necked Parakeet: Recorded at Norwich June 8th, North Walsham Wood Oct. 22nd, Caister-on-Sea Sept. 8th, Cley Nov. 4th and Holme Oct. 24th.

Barn Owl: Recorded at 65 localities including one of the dark breasted race at Gramborough Hill Salthouse March 20th.

Little Owl: Recorded at 39 localities.

Long-eared Owl: Single pairs bred at Salthouse Heath, East Wretham and Fritton. Breeding season records from Brancaster Common, Brettenham, Cley (Walsey Hills) and Brandon. Wintering birds at Kelling Heath, Roydon Common, Reedham (2), South Runcton, Gorleston, Massingham, Wells and Winterton. Migrants in off sea at Cley Nov. 25th, Sheringham (3) Oct. 1st and one on 15th, Caister-on-Sea Nov. 29th,

Winterton Oct. 1st and Weybourne Nov. 16th. Also singles on gas-production platforms 40 miles NE of Yarmouth Oct. 17th, 19th and Nov. 1st.

Short-eared Owl: Maximum winter numbers Halvergate 23 Feb. N/E Coasts: Migrants in off sea as follows: Sheringham Oct. 19th, 22nd, 29th,Nov. 2nd, 5th, 9th, 16th and 25th; Thornham Oct. 12th; Cley Oct. 14th and 18th (3); Happisburgh Oct. 1st and Nov. 26th; Winterton Oct. 18th (2). No breeding records.

Nightjar: Breeding records received from Brecks: Brandon, Devil's Punchbowl (undoubtedly under-recorded). West: Roydon Common, Swaffham Forest, South Wootton, Narford, West Bilney. North: Salthouse Heath. East: Winterton, Fritton. Central: Horsford (only one male recorded). Further reading: 'Nightjar habitats and breeding in East Anglia' by R. Berry *(British Birds* 72 pp 207-218).

Swift: First recorded Breydon, Cley and Snettisham April 27th. 1300 moving westwards Sheringham Aug. 5th. Delayed exodus from Norwich where still 50 Sept. 27th decreasing to one Oct. 6th. Exceptionally late birds Nov. 10th at Cley, Brancaster and Hunstanton.

Kingfisher: Breeding confirmed at Cantley, Catfield (nest in fallen tree roots), How Hill, Narborough, Snettisham, Sparham Pools, Strumpshaw (2 nests) and West Acre. One trapped at Sheringham Aug. 11th.

Hoopoe: Spring records as follows: Winterton March 12th, 25th (2), 30th and April 29th, Wells April 9th, Holme April 28th/29th, Happisburgh May 1st, Hunstanton May 11th, Snettisham May 13th and Gorleston May 16th. One Autumn record: Caister-on-Sea Aug. 18th.

Wryneck: In Spring an early arrival at Hunstanton April 13th followed an exceptional number of migrants on North and East coasts (including Hickling and Kelling Heath) April 29th - May 23rd involving at least 26 birds. All records of singles apart from 5 Scolt Head May 5th/6th. By contrast few Autumn records, all in Sept: Blakeney Point 1st and 9th /10th, Blakeney 4th, Wells/Holkham 7th (3) and 9th/10th and Caister-on-Sea 25th.

Short-toed Lark: North: Weybourne an immature Oct. 14th/15th and an adult Oct. 15th - 20th (GED, SCJ, KBS *et al*). The fourth and fifth county records.

Woodlark: Records received from only 3 localities in Brecks; unusual number of 17 Santon Downham July 15th. North: One pair bred. Elsewhere two Cley Jan. 7th, Cromer Feb. 22nd/23rd, Winterton March 3rd and 26th and April 23rd - May 2nd and Scolt Head April 5th - 13th.

Shore Lark: Regularly recorded Cley—Sheringham up to May 3rd and from Oct. 15th with maximum of 35 Salthouse Dec. 3rd. Elsewhere: Holme Jan. 2nd, Oct. 29th and Nov. 3rd and 4th (2), Burnham Overy Oct. 21st, Holkham May 13th, Blakeney Point Oct. 2nd, Winterton Oct. 8th and Nov. 8th and Breydon Nov. 6th (2).

Sand Martin: Breeding colonies (notated by number of pairs) include the following: Aldeby 500, Colney/Bawburgh 4-500, Edgefield Hall G.P. 90, Haddiscoe 500, Hardley 80, North Walsham up to 100, Norton Subcourse 50 and Tottenhill 384 (marked reduction). On Aug. 5th an albino at Sheringham and a very pale buff leucistic bird at Weybourne.

Swallow: First recorded March 30th at Snettisham, but few other records until third week of April. Again a considerable number of November observations with latest on 17th at Winterton.

House Martin: A complete albino Sheringham Sept. 30th. Many November records with latest Cley on 21st.

Richard's Pipit: North: Holme Jan. 14th - Feb. 5th (HBO) (first county wintering record) and Sheringham Oct. 2nd (JM *et al*). East: Winterton Oct. 27th (PRA).

Rock Pipit: Birds showing characteristics of Scandinavian race *littoralis* at Weybourne March 25th and Breydon April 7th.

Water Pipit: Majority of records from Hickling where irregularly recorded up to April 17th (maximum of 6) and from Oct. 20th. Elsewhere three records of 1/2 Cantley B.F. in Jan., Oct. and Dec., Blakeney Point Oct. 14th and Horsey Oct. 28th (2).

Yellow Wagtail: Extreme dates March 31st (Cley) and Oct. 8th (Winterton and Blackborough End).

Blue-headed Wagtail: Spring records as follows: Cley April 23rd and May 17th, Hickling four singles April 25th - May 10th and May 27th (2), Hunstanton April 29th and May 14th, Wisbech S.F. May 9th (2), Breydon May 10th, Winterton May 12th, Stow Bridge May 13th, Colney May 17th - 24th and Buckenham June 10th. One Autumn record, Scolt Head Oct. 1st.

Grey-headed Wagtail: North: Cley May 25th (2), 26th and 28th, Kelling Quags May 30th. Broads: Hickling May 24th (2), 26th, 27th and 29th.

Ashy-headed Wagtail: A male Hardley Flood May 19th (JCE). The fifth county record of this race.

Grey Wagtail: Breeding records only from Ebridge, Marlingford and River Nar, where four pairs located which only reared total of 14 young in season due mainly to human interference.

Pied Wagtail: Roosting records include up to 70 in reeds at Foulden for most of year (including summer) and 80 at East Tuddenham in autumn.

Waxwing: Few records as in 1977: Costessey Jan. 1st and 9th, Castle Acre Jan 21st,North Walsham Jan. 27th and Feb. 6th, Thorpe St. Andrew Dec. 16th, Holme Dec. 18th (2) and Sheringham Dec. 22nd.

Black-bellied Dipper: Central: Gressenhall Jan. 1st - March 10th. (PH).

Alpine Accentor: North. Sheringham April 30th - May 4th, trapped on 1st (KBS *et al*). First county record of this mountain-breeding species which spent it's stay along a short length of cliff face.

Nightingale: Recorded singing at 31 localities. Passage birds at Happisburgh April 28th and Wells Sept. 10th. The B.T.O. is planning a further Nightingale census in 1980; all records will be welcomed.

Bluethroat: Spring: Male Titchwell May 20th, female Cley 20th - 22nd, male in song Blakeney Point 22nd and female Salthouse 23rd. Autumn: Blakeney Point Sept. 1st.

Black Redstart: Breeding: East: Yarmouth three pairs bred, one other singing male. North: Single pairs bred at two different localities, one of which also used in 1977. Winter records: Sheringham: Jan. 4th - April 1st and Dec. 21st - 28th, Gorleston Feb. 2nd, Weybourne Feb. 7th and Yarmouth Dec. 13th. Passage birds March 16th - June 6th and Oct. 14th - Nov. 30th with majority of records in spring. One at Wissington June 20th.

Redstart: Successful breeding noted at Fritton and also Felbrigg, where up to eleven singing males in May.

Whinchat: Successful breeding noted at Brettenham Heath, Bridgham (11 juveniles), Stanford Warren and Winterton.

Stonechat: Breeding pairs noted at Breydon (1), Winterton-Horsey (4), Kelling Heath (1 - 2) and Weybourne (2). Also present at East Wretham Heath in June. At least 10 migrants at Happisburgh Oct. 27th - 29th, 5 of which were trapped.

Wheatear: A total of 25 - 30 pairs bred at Weeting Heath. Late migrants at Breydon Nov. 6th and Swaffham on 11th.

Pied Wheatear: East: A first-summer male Winterton May 28th (PRA *et al*). The first county record of this spectacular south-east European breeding species.

Desert Wheatear: North: A male Blakeney Point/Cley Oct. 14th - 17th (SJA *et al*). the second county record, the first being in 1907.

Ring Ouzel: Spring passage March 29th - June 3rd with maxima of 5 Sheringham April 28th, 5 Winterton April 30th and 5 - 6 Scolt Head May 6th. Inland records at Gooderstone April 8th - 16th, 3 Crostwight April 25th and Castle Acre May 10th. Early autumn migrants Holme Sept. 2nd and Breydon on 7th. Only small autumn passage Sept. 30th - Nov. 12th involving total of 15 birds; all records of singles apart from 2 Holme Oct. 26th.

Blackbird: Large immigration noted at Happisburgh Oct. 27th when 10,000 birds present.

Fieldfare: Very late spring departure with many flocks still present until mid-May and smaller numbers noted at several localities until end of month. Two still present Foulden June 1st and up to 4 remained Winterton until 21st. Two present Holme throughout June and July. First Autumn records Aug. 19th at Cley and Sheringham. Large immigration Oct. 28th with 15,000 south-west Hunstanton-Heacham and 11,900 passing over Snettisham.

Song Thrush: An unusual fall of at least 100 birds of British race at Sheringham Sept. 23rd during prolonged south-westerly winds.

Savi's Warblers were singing at Horsey and Hickling

Redwing: Several records of late migrants during May, especially at Winterton where singles also seen June 1st and 6th. Large diurnal immigration Winterton Oct. 27th with 1000/hour arriving from east also 'hundreds' coasting north at same time. A leucistic bird at Holkham Dec. 3rd.

Cetti's Warbler: Broads: Total of 23 singing males in Yare Valley at Strumpshaw, Wheatfen and Rockland, no details received from Surlingham. Elsewhere singing males at Hardley Flood and Hickling in Jan. and Aldeby in April. One ringed Alder Carr, Gillingham April 22nd controlled Oulton Broad Oct. 28th.

Grasshopper Warbler: Broads: a substantial increase noted at Strumpshaw where 17 pairs present.

Savi's Warbler: East: one singing Winterton May 2nd - 11th (PRA). Broads: Singing males at Hickling and Horsey during summer from April 22nd, but no definite proof of breeding.

Aquatic Warbler: 1977 record: East: Waxham Sept. 25th (RAB, JRW).

Great Reed Warbler: One present at a locality in West May 23rd - June 10th (JL).

Icterine Warbler: Fewer records than in recent years, all in *Sept.* North: Holme 6th, Sheringham 8th/9th (trapped) and Holkham 9th/10th. East: Gorleston 22nd.

Barred Warbler: Only one record. Wash: Hunstanton G.C. Aug. 25th.

Blackcap: Winter records: Norwich Jan. 10th, Mulbarton Jan. 31st and Brinton (dying) Dec. 31st. Less than in recent years.

Yellow-browed Warbler: Wash: Hunstanton Oct. 1st - the bird was feeding amongst the cliff-top vegetation and on three occasions flew to a nearby beach shelter picking insects from the woodwork and glass, passing within inches of observer's head (HRR). North: Wells Oct. 8th with a second bird also present Oct. 11th (GED, SCJ *et al*).

Radde's Warbler: North: Holkham Oct. 13th - 15th (SJMG *et al*). The seventh county record.

Wood Warbler: Spring migrants Blakeney Point and Winterton May 4th and Holkham May 13th. Males in song in breeding season at Blickling, Felbrigg, Kelling (2), Sheringham (2-one pair bred) and Snettisham. Only one Autumn migrant, Holkham Aug. 20th.

Chiffchaff: One winter record, R. Yare, Norwich (UEA) Feb. 28th.Birds of Northern races at Holkham Sept. 17th *(albietinus* or *tristis)* and Sheringham Oct. 1st *(albietinus).*

Firecrest: Spring: Holme March 19th and May 1st and 7th, Titchwell March 31st, Wells April 1st and 17th - 19th, Cley April 3rd (2) and 18/19th, Kelling Heath April 5th and Sheringham April 19th. Autumn: Holme Oct. 4th - 8th, Wells/Holkham Sept. 9th/10th and Oct. 11th and Sheringham Sept. 7th.

Spotted Flycatcher: Late migrants at Scolt Head (2) Oct. 18th and Sheringham on 20th.

Red-breasted Flycatcher: North: Wells Sept. 7th (FME) and Salthouse Oct. 1st (ERP and EDP). East: Happisburgh juvenile male trapped Oct. 18th and juvenile female trapped Oct. 26th (BMEU).

Pied Flycatcher: Spring: Many more records than normal with up to 4 birds at 25 localities April 29th - May 29th, including observations well inland at Attleborough, Horsford, Narborough and Thetford. One pair bred successfully at Felbrigg Park - see page 4. Autumn: Only very small passage with maximum of 15 at Sheringham Sept. 7th; latest Wells, Oct. 23rd.

Bearded Tit: In first winter period away from breeding localities upto 30 King's Lynn B.F. Jan. 15th, 4 Holme Feb. 19th and two R. Yare, Norwich (UEA) and one Colney G.P. March 5th. At Strumpshaw very large numbers at beginning of year (after successful breeding season in 1977) with maxima of 200 in Jan. and 300 in Feb; sudden mass emigration in cold weather in Feb. leaving only two breeding pairs. Records

from breeding season incomplete but include only 12 pairs Hickling (dramatic decline compared with 1977) and successful breeding at How Hill. None nested Salthouse Marsh for first time in many years. As compensation a new site found in tidal reeds between Brancaster and Brancaster Staithe where 4 nests found and fledged young seen. In Autumn 2 Wisbech S.F. Oct. 8th with 3 present Oct. 14th, 2 Holme and 2 Fritton Oct. 31st and 5 - 6 Burnham Norton Broad Nov. 14th.

Long-tailed Tit: Two Fritton March 24th with characteristics of the white-headed Northern race (TWF). Passage birds noted at Snettisham as follows: 10 Oct. 8th, 4 Nov. 6th and 6 on 8th.

Blue Tit: Wash: 43 passage birds at Snettisham Oct. 8th.

Treecreeper: One with characteristics of the Northern race at Weybourne Nov. 4th (FME). The first reported county record of this distinctive race.

Golden Oriole: East: Winterton June 11th (PRA).

Red-backed Shrike: An above-average number of spring migrants: Hickling May 18th, Horsey Gap May 23rd and 29th, Sheringham May 26th, Weybourne May 22nd, Blakeney Point May 22nd/23rd and June 4th, Holkham May 9th, Scolt Head (3) and Hunstanton May 20th. Isolated records Winterton June 21st and Sheringham June 30th (flew in off sea). Breeding season: County total of 8 pairs, at least 4 of which successfully reared young. Two new sites discovered, but unfortunately breeding ceased at a traditional locality in East. Only 5 autumn pasage birds: New Costessey Aug. 13th, Holme Sept. 4th and 17th, Sheringham Sept. 7th and Holkham Sept. 10th.

Great Grey Shrike: An apparent decrease of records compared with recent years. In first winter period records from 9 localities with latest Cromer April 16th. A bird which had wintered at Salthouse Heath last seen April 1st and subsequently found dead. Simultaneous autumn arrival at Sheringham, Scolt Head and Snettisham Oct. 1st. Subsequent records in second winter period from 9 localities.

Woodchat Shrike: North: Holme June 1st (PRC).

Carrion Crow: West: Winter roost at Roydon Common contained up to 250 birds in Nov. - Dec.

Hooded Crow: A marked decline in number of records. In first winter period maxima of 25 Barton Fen roosting with Carrion Crows Feb. 27th and 10 Roydon Common March 26th. Summer records at Breydon June 10th, 16th and July 14th and Winterton June 21st. In second winter period only isolated records of singles and one record of two birds.

Starling: Huge immigration Oct. 28th with 200-250,000 flying westward at Scolt Head and 100,000 in 3 hours flying into Wash at Hunstanton—Heacham. See pages 8-10.

Chaffinch: A very large immigration Oct. 27th and especially Oct. 28th, when 30,000 moving west at Sheringham and 50,000 moving west at Scolt Head. The same movement noted at Hunstanton—Heacham flying into the Wash. See also pages 8-10.

Brambling: Latest spring record Holkham May 14th. A large movement Oct. 28th in association with Chaffinches; 'thousands' moving west at Scolt Head and 2,000 moving south-west at Hunstanton-Heacham.

Serin: North: Holme single females May 28th - 29th and Sept. 7th (HBO). Sheringham Aug. 18th (KBS).

Goldfinch: North: Largest spring passage at Sheringham occurred May 14th with 550 westwards.

Siskin: Largest flock reported was 30 at West Acre Jan. 30th. Two interesting records of passage birds received = total of 30 flying north-westwards Happisburgh May 4th (one ringed) and 80 flew in during 1½ hours watching at Hunstanton Oct. 28th.

Twite: One inland record, 13 Hilgay Fen March 27th. Usual coastal observations.

Mealy Redpoll: North: 4 Sheringham Jan. 14th and one Feb. 8th, Weybourne 4 Jan. 14th and Cley two Feb. 5th and 26th. East: Winterton Sept. 30th. Broads: Hickling Feb. 15th.

Arctic Redpoll: North: Cley Jan. 5th 1973 (CDRH). Not previously published.

Crossbill: Widely reported from Brecks including breeding records with largest flock 20 Thetford Warren July 7th. Also regularly recorded Sandringham area and Wells/ Holkham, one pair successfully breeding at latter locality. Elsewhere 2 Holme Feb. 14th - 18th and one June 26th, 2 Sheringham March 11th and 2 Aug. 6th; 2 Two Mile Bottom March 18th, 22 Lound June 23rd and Kelling Heath Aug. 3rd with 3 on 4th.

Hawfinch: At East Wretham breeding proved for first time for six years but no reported build-up of winter flocks, largest number being 6 May 1st. Elsewhere: Sturston Jan. 22nd, Cringleford Feb. 26th and 28th, Hunstanton April 3rd, Hickling May 6th, Swaffham Heath May 21st, Santon Downham 2 June 18th/19th and 4 July 7th, Tommy's Belt June 25th, Sheringham July 22nd, Winterton Nov. 8th and Foulden Dec. 4th. Also reported from East Walton, Gooderstone, Hilborough, Thetford and West Acre in April.

Lapland Bunting: North: Recorded up to April 18th and from Sept. 20th with maxima of 9 Sheringham Feb. 11th and 12 Cley Dec. 11th. A late male at Hunstanton G.C. May 15th. East: Halvergate 8 Jan. 7th and 11 Jan. 21st, Breydon 10 Feb. 12th and 2 Oct. 13th, Winterton total of 17 passage birds on seven days Sept. 17th -Oct. 29th. Inland: Hassingham 5 flying west-south-west Feb. 18th.

Snow Bunting: North: A noticeable reduction in sizes of flocks reported with maxima of 100 Holme in Nov., 35 Titchwell in Feb. and 150 Cley in Nov. Wash: at least 100 Old Hunstanton in Jan. but low numbers at Snettisham, where counts in single figures except for 35 Jan. 26th and 12 on 30th. East: Breydon 180 Feb. 4th with 72 on Feb. 19th. Broads: Hickling 24 Feb. 15th. Extreme dates April 15th (Sheringham) and Sept. 18th (Cley).

Ortolan Bunting: Three records of spring males: trapped Happisburgh April 30th remaining in area 10 days, (BMEU *et al*), Winterton May 9th (PRA) and Salthouse May 23rd (SJMG). No autumn records.

* * *

The following, not mentioned in the Classified Notes, were also recorded in 1978 (breeding species in italics): *Canada Goose, Mallard, Kestrel, Red-legged Partridge, Grey Partridge, Pheasant, Water Rail, Moorhen, Coot, Ringed Plover, Lapwing, Curlew, Black-headed Gull,* Herring Gull, Great Black-backed Gull, Kittiwake, Razorbill, *Stock Dove, Woodpigeon, Collared Dove, Turtle Dove, Cuckoo, Tawny Owl, Green Woodpecker, Great Spotted Woodpecker, Lesser Spotted Woodpecker, Skylark, Tree Pipit, Meadow Pipit, Wren, Dunnock, Robin, Mistle Thrush, Sedge Warbler, Reed Warbler, Lesser Whitethroat, Whitethroat, Garden Warbler, Willow Warbler, Goldcrest, Marsh Tit, Willow Tit, Coal Tit, Great Tit, Nuthatch, Jay, Magpie, Jackdaw, Rook, House Sparrow, Tree Sparrow, Greenfinch, Linnet, Bullfinch, Yellowhammer, Reed Bunting* and *Corn Bunting.*

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NORFOLK MAMMAL REPORT 1978

Editorial

The Editor is pleased to present the 23rd Norfolk Mammal Report.

Few readers of our local newspapers can be unaware of Percy Trett's energetic interest in natural history. His name is so frequently followed by the words "...the well-known Yarmouth naturalist", that they can almost be mistaken for part of the name itself. Percy has a wide-ranging interest in many aspects of marine biology and in our special article he describes how this led to a long association with the seals on Scroby Sands. We are very pleased to include his very personal account of the work and his photographs not only for the information it presents about the seal colonies that make use of this local, unstable phenomenon, but also to mark Percy's year as President of the Norfolk and Norwich Naturalists' Society.

Thanks are expressed to all contributors to the report and apologies offered in advance to any whose names have inadvertently been omitted. All contributions, however trivial they may appear, are gratefully accepted. Each small item of information adds a piece to the total picture. Working on the report is rather like trying to solve a jig-saw puzzle without a master picture and with most of the pieces missing.

All observations submitted are filed and numbered and the information listed on the species cards for the year. After the report has been compiled the year file is stored in Norwich Castle Museum, Natural History Department. More than one report of the same incident sometimes occurs and this can be additionally useful because we all have our own way of looking at things. Taking this point further, it is interesting to read the varied patterns of reporting followed by many of our regular contributors. Some are anecdotal, some range far and wide and list sightings, road casualties, counts from keepers' gibbets from many places, some prefer to concentrate on one home area and record very detailed observations. An example of the latter is the way in which mole-hill eruptions in a particular field were noted while they varied during changes of season and climate. Some contributors must have the Ordnance Survey grid and reference numbers projected onto the terrain as they pass by, so meticulously do they list by Km. squares their sightings and signs. This is very helpful when completing distribution maps.

The editor gratefully acknowledges the specialist help he has been given so freely by Dr I. Keymer, Veterinary Investigation Centre, Dr L. M. Gosling, Coypu Research Laboratories, Arthur Woodhams, Pest Control Officer, MAFF, Rex Whitta, Wildlife Ranger, Forestry Commission District Office, Santon Downham, and John Goldsmith at the Castle Museum, Norwich. John continues to answer queries and accept specimens of all vertebrates, not just mammals. The address is: The Castle Museum, Norwich NR1 3JU. Tel: Norwich 22233 ext. 649.

Notes for the 1979 edition of the Norfolk Mammal Report should be submitted by the end of January 1979 to R. C. Hancy, 124 Fakenham Road, Taverham, Norwich NR8 6QH. Tel: Norwich 860042. Perhaps the completion and posting of notes could be part of the list of New Year Resolutions? It will be realised that the high cost of postage does not always permit individual acknowledgement.

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Scroby Island and its Seals

by Percy Trett

Scroby Island lies about 2½ miles out in the sea off the East Norfolk Coast, just NE of Great Yarmouth. It is in the main a sand bank formed on top of a ridge of hard boulder clay. The fierce tides and winds of this area pile up the fine sand onto the ridge and form an island that constantly changes its shape and position in the sea. On occasions the island disappears entirely beneath the waves only to re-emerge a few weeks later, maybe half a mile either North or South of its last position. Surrounded, as it is, by lesser sand banks, it is a dangerous place to approach by boat and is normally left well alone. The absence of humans, makes the place attractive to seals and there is a residential herd of about 120 common seals *(Phoca vitulina)* using the area. John Woolston and I used to accompany Robin Harrison on his bird ringing expeditions to the island, some thirty years ago. Robin was the official ringer for the area and as such had a busy time ringing the numerous sandwich, common and occasionally little terns that bred there each summer. Woolston and I were studying marine biology and were more interested in the life surrounding the island. The seals, naturally, came within the scope and were made more interesting, as at this time, the common seals were dropping their pups. Our interest in seals became known and shortly we were asked to tag the pups for a Dutch fur company, using the continental round metal tags. We did this for several years, but the tagging was of limited success, as the common seal's normal habitat, is that of sandy beaches, the identification marks were soon abraded from the tags and eventually the metal became very sharp and dangerous to the beast. One point of interest did come from this experiment as we learnt that there is a fairly constant shift of common seals from our sand banks to those of Europe and vice versa.

During the early summer of 1958, we noticed that there were about seventeen larger and heavier seals amongst the herd of commons and were fairly certain that these were grey seals *(Halichoerus grypus).* To corroborate this we invited the late Earl of Cranbrook (then President of the British Mammal Society) and Dr K. M. Backhouse to join us and confirm our observation. They did this during June of that year, seeing 7 greys on that occasion. Lord Cranbrook asked us to keep a weekly log of the number of these large seals and let him know if there was any increase, especially during the autumn and early winter period. Our notes record that by October the numbers had increased to about 100 greys and that during late November the large bulls were becoming territory minded. On the 29th of November "Skipper" Jack Woodhouse of Caister told us that he had seen four small white seals on the island. We went out the following day and found that there were four newly born grey seal pups there. On December the 7th, Prof. H. R. Hewer, of the Imperial College, London came with us and using London Zoo metal tags, tagged eight pups (all female). We paid periodic visits to the island that winter, but found only two more pups, without tags. Those that had been tagged, moulted and we believe successfully got away to the sea. Since then, each winter, except for this past winter (78/79), the grey seals have bred on the island. Once the local fishermen reported that during November there was a concentration of 700 grey seals on the island. This, I thought was a grossly exagerated figure, possibly put about

Only the wary look in the eye of this peaceful looking Grey seal cow betrays the fact that careless approach can turn her into an attacking fury.

Ruth King (Secretary B.S.A.C.), Percy Trett and Chris Hale tagging a grey seal pup.

This Common seal pup is just two days old. Note the remains of the umbilical cord.

in order to lend weight to their argument for a cull, which they were pressing for at that time. I went out to see for myself and was somewhat surprised to count 450+ greys hauled out on the island. Allowing for about a third being away fishing, I had to concede that the fishermen were probably right in their estimation. Nearly all that number of beasts proved to be non breeders and laid with the non breeding herds, leaving the harem bulls and their herds of breeding cows well alone. That year we counted 52 pup greys born in a period covering Christmas and after. This was the largest number of greys that we have seen on the island. Why they came is a bit of a mystery, but we noted that a cull was taking place at that time on the Farne Islands, so feel they may have fled the disturbance there. The greys on the Farnes, that used to be heavily persecuted, have been protected and increased in numbers due to the tireless efforts of Mrs Grace Hickling and her team of field workers there. The breeding beaches etc on the Farnes are usually occupied and the cows have started pupping by late October, breeding reaching a peak during early November. Whilst, at Scroby, the breeding herds are usually begining to produce pups by early December, reaching a sharp peak in numbers about 20th December. These facts, lead me to believe that Scroby takes the overspill of late breeders from the Farnes. I believe that late pupping cows, approaching their time find that the beaches on the Farnes are over crowded, so come to Scroby and haul out here where young bulls have already established territories. This is somewhat borne out by the fact that several of the adults bear the orange tags of the Farne Islands.

When we visit Scroby during December, after having hauled our inflatable boats well up the beach and securely moored them, we locate the position of the main non breeding herds and if we are lucky and the wind is blowing from the herds to us, so as not to carry our scent to them and panic them into the water, we will be able to get close to them. We are usually able to walk to within 500 yards of the herds and then we have to get down and crawl the rest of the way. Done cautiously we find that oftimes get to within 25 yards of the nearest beasts. Once in position, we count the numbers, noting how many are greys, how many are commons, any with distinctive markings, any with tail tags, and if so, what colours. Having made our notes, we leave as we came, cautiously. We then make our way over to the breeding herds. As we approach, most of the cows take to the water, leaving their pups littering the beach. These pups are reluctant swimmers for the first two or three weeks of their lives. We keep clear of the cows that have stayed with their pups as they are usually extremely agressive. Sometimes we will lie down beside a newly born pup, the mother who is watching from just the otherside of the waves doesn't like this and will usually haul out to drive off what she takes to be a strange cow near to her pup. As she comes over the sand rather like a giant looping caterpillar, we notice that everytime she hits the sand, that she wobbles all over like a jelly — this is understandable as she has a covering of about 3'' of Blubber. We roll out of the way as she comes up to the pup; she catches our scent and returns to the sea. This layer of blubber is necessary, as during the period that she is lactating (usually 3 to 4 weeks), she will not feed, but spends her time guarding her pup and keeping the youngster from approaching neighbouring strange cows. If it happens that a pup does go to a strange cow other than its mother, she will pick it up by the scruff of its neck, savagely bite and shake it before tossing it aside. If per chance it lands near yet another strange cow, the procedure will be repeated. The pup weighs about 30 lbs at birth and will have a weekly weight gain of about 30 lb per week, which indicates the richness of the milk that the cow is producing. Needless to say at the end of the lactating period, when the cow deserts her now huge pup, her layer of blubber has gone. The pup is born with long white fur. At about 2½ to 3 weeks the beast starts to moult, first at the extremities, on the snout, the flippers and the tail. Within a short period all the white fur has gone and a most beautiful mottled grey second coat appears. This is the pelt that the furriers

want, especially as the young beasts have not, as yet, been fighting and so bear no scars.

Turning now to the common seals, these breed during the summertime, usually late June and early July. On Scroby we have a herd of about 120 beasts, though on one occasion there were over 300 commons on the island. When the pups are born, they will have already shed their first coat of white fur, their milk teeth and the sheaths from their claws, inside their mothers. Indeed when you examine the placenta of the common seal you will find the fur with it. Thus, when the common seal pup is born it is much further advanced than the grey seal. It can and does swim from birth. Also it is a very friendly little beast; two things that sometimes brings it into trouble. The pup will be swimming with its mother, usually on her back when up will spring one of those onshore squalls that happen so frequently during the summer. The pup gets parted from its mother and ends up on the Yarmouth beaches. The visitors will return to the beach as soon as the squall has passed and when they find the pup, they will play with it for a while and then, not being able to get rid of it, will call the Police. The pups are usually brought in to us and do present quite a problem, for not only do they wail all night, they are also, reluctant feeders. These young beasts we have to feed by inserting a stomach tube and then pump in a rather smelly mixture of cod liver oil, warm milk and animal fat (Normally butter). We return the common seal pups to the island as soon as possible. Something we cannot do with stranded grey seal pups, for we would be sending them to a certain death at the hands of strange cows who would reject and savagely maul them. With common seals it is a totally different matter. For one thing they appear to be much gentler creatures and another is the high infant mortality rate amongst the commons, up to 52% on Scroby. This leaves a number of cows, heavily lactating, who for shear relief to themselves, will adopt a stray pup. Our method of returning the pups to the island is to give them to the fishermen, who, for the summer season have laid aside their nets for the more profitable business of taking visitors out to "Seal Island" to see the seals. Any fisherman, with a pup seal under his arm, telling the visitors that he is going to return the pup to the island is assured of a full boat in a very short time. Naturally the fare rises on these occasions. We have to be careful and see that the pups are distributed equally amongst the men, so that jealousies are not aroused.

The fishermen in Yarmouth have an *odi et amo* relationship with the seals. In the Autumn when the longshore herring are beginning to arrive, the grey seals are beginning to assemble on Scroby to breed. They feed on fish and being intellegent creatures, soon realize that the sound of a longshore fishing boat usually means an easily acquired meal of herring. At eventide the fishermen put out from the harbour and go to the fishing grounds where they shoot their nets, up to a mile of them. At one end will be a "Dan" buoy, whilst at the other will be the fisherman in his boat. Here he will ride out the night. The grey seals will see which end of the fleet of nets the boat is and they will go and wait at the other. As the night comes on, the plankton, on which the herrings feed, will rise in the water — So will the herrings. The fish get themselves lightly emeshed, by their gills, in the nets. The seals will then start feeding, going along the nets plucking out the plump fish. Alls well until the beasts catch their teeth in the meshes, then they back away in panic, tearing huge holes in the net. This is bad enough, but worst is to come, as all the fleet of nets will be shaken and most of the fishermans catch will drop out, leaving an understandably irate fisherman with torn nets and no fish to show for his nights work. One of the results of this sort of incident has been for the fishermen to call for a cull of seals, when they become too numerous and troublesome, a move that the most ardent conservationist finds hard to oppose. The problem of how many is "too numerous" has, in the past, led to protracted and heated arguments. Luckily this is now in the past and the situation is monitored by the Seal Research Unit at Cambridge. Unfortunately some fishermen take the law into their own hands and either borrow a shotgun from a friendly farmer or land on the

breeding beaches and clubs the pups to death. Both ways, are to my mind inhuman. The fisherman who has borrowed the shot gun sees a seal surface near his boat. Naturally the seal looks at the boat. The fisherman grabs the gun and fires at the beast's head and 200 to 300 light lead pellets fly towards the beast. At 45 yards range, they cover a 30" circle. None of the pellets are heavy enough to penetrate the seals skull and kill it. All that happens is that the beast gets about eighty pellets striking it in the face, some of which hit it in it's eyes and the beast is blinded. A blind seal dies horribly. It usually hauls out on the beach and will keep off the greater black backed gulls until hunger so weakens it and it is unable to fend them off any more. They will then start to eat the beast whilst it is still alive. During the 64/65 winter Inspector Bob Waters of the R.S.P.C.A. and I had to go to the island by R.A.F. helicopter, in order to destroy a number of wounded beasts that had been blinded by shotgun. The clubbing of pups, besides being illegal, is I feel an extremely cruel way of destroying beasts as it usually takes several blows before the animal dies. If a cull is necessary, let it be supervised and organised by the Seal Research Unit and let the killing be done quickly by expert rifle shots using high powered rifles or if pups have to be killed, let them be dispatched with a humane killer.

We have given the various fishing fraternities of our area talks, showing them how to identify common from grey seals, telling them of the breeding periods and feeding habits of the beasts. We have pointed out that the common seal feeds in the main on crustacea and molluscs, of which there is not a fishery in East Norfolk and also that they the fishermen make more by taking visitors out to Scroby to see the seals during the summer than they make from their autumn fishing. This has resulted in the Yarmouth boatmen being highly protective towards the common seals herds on Scroby, though less than enthusiastic about the greys. Still the December storms and Seal Patrols mounted by the Yarmouth branch of the B.S.A.C. normally takes care of the greys during their breeding season when they are most vulnerable.

Classified Notes

Insectivora

The mildness of previous autumns may have led us to believe that hedgehogs *Erinaceus europaeus* would be less in evidence during the colder days of late 1978 but many observers saw individuals engaged in late foraging. No doubt they were still attempting to build up reserves during a very difficult season. Those that failed to do so surely also failed to survive the severe winter that followed. One hedgehog was seen attacking a starling in Saxthorpe during the first part of December, which reminds us that although it is one of the insectivores, the hedgehog is in fact omnivorous and will take eggs, young and weakly adult animals. Most contributors spoke of a high number of road casualities. Our "roving reporter" based in Swaffham, who covers many parts of the county during the course of the year, counted 79 between 30th April and 14th December. This was about twice the number she counted during 1977. A regular traveller on the B1149 between Holt, Aylsham and the outskirts of Norwich noted 57 between 31st March and 4th December. Following a day of heavy rain and a warm, damp, misty night, he found 5 dead on the morning of 31st July. Other travellers along regular routes may find further interest if they note weather and road conditions at the likely times of these fatal accidents.

The Mole *Talpa europaea* is described as extremely abundant by contributors from Weeting, Buxton, Saxthorpe and generally in the west of the county. Most reports are of mole-hills, fortresses and corpses on keepers' gibbets, but one observer was able to watch a mole hunting in leaf litter at West Acre. A cream/gold varient was taken live at Stokesby during May and released a short while later. The abundance in Saxthorpe resulted in 12 being caught in one garden during early summer. Another made its home in a heated greenhouse and successfully eluded all attempts to catch it.

Many of us find dead Common Shrews *Sorex araneus* but only our pathologist member, Dr Ian Keymer, would be able to tell us that the one he found in Foxley died of acute pneumonia! There were only three reports of the Pygmy shrew *Sorex minutus* which is by no means a true indication of numbers or distribution. Obviously many corpses of shrews were found by members, especially during the late summer and early autumn, but were not reported due to the feeling that the finds were too trivial or possibly confusion between the species. It cannot be emphasised too often that everything is worth noting and it does seem true that the more you note the more you see. The single Water shrew *Neomys fodiens* was seen at Cley, the third report from the reserve in five years. Have they been seen by any significant proportion of the thousands of visitors or do these records demonstrate the elusive nature of our small mammals? Whatever the answer, it is good to know that the local population in that area is continuing.

Chiroptera

It is also good to see from correspondence that more members are trying very hard to make notes on bat distribution. The editor appreciates their efforts and also their frustration at seeing unidentifiable flying objects coming from and returning to unknown regions. Pipistrelles *Pipistrellus pipistrellus* were again the most frequently identified and reported species, being plentiful in widely scattered localities. At East

Tuddenham they were flying late into the autumn. At Hillside Avenue School, Thorpe, there was consternation at the succession of dying pipistrelles found under the verandah. One examined by Dr Keymer had died of pneumonia but the original cause remained undiscovered. There was an unusual number of bat deaths reported country-wide during the year and there appeared to be a link with a lack of insect food though this was not apparent with the specimen examined.

Noctules *Nyctalus noctula* were seen to fly at Ludham, Devil's Punchbowl, Shadwell, Buxton and Santon Downham. The Long-eared bat *Plectotus auritus* seems to be the bat species that provides the odd behavioural stories. At Itteringham one flew in and out through a window while at Sandringham one collided with a car. At the time of writing the editor has heard of a double tragedy of two Long-eared bats colliding with a moving car. Their mode of flight may make it more difficult for them to take swift avoiding action. Certainly they are the species most frequently reported as having been caught by cats.

Again, Long-eared bats are the most frequently recorded users of the bat-boxes that have been set up in Forestry Commision compartments as part of the national experiment. Pipistrelles are the only other species so far recorded in the Thetford Forest part of the experiment which, at the time of writing, is in its fourth season. A stable colony, dependent upon the boxes during the summer, has formed itself. A total of 138 individual bats have been ringed. Of the six widespread sites, Thetford is the nearest approach to the ideal and the number of recorded individual bats is much higher there than at any other of the sites, although some have recorded more species. Now that the colony has formed itself and data is being collected, it is to be hoped that means will be found to continue the experiment beyond its originally allotted span which was set at five seasons.

Lagomorpha

Myxomatosis effects rabbit *Oryctolagus cuniculus* numbers very variably in different areas. In spite of the outbreak of the disease during the previous autumn numbers at Weeting were still high. It is clear from reports from many other centres that an active policy is necessary to keep them under control. Prevention is always better than cure and rabbits do not respect abstract descriptions on deeds or even the more concrete barriers of boundary fences. An all-white rabbit was seen at Crostwick and a definite albino was sighted at Keswick. It is hoped that last years suggestions for observations on rabbit colonies will produce some evidence when the sets of notes arrive next spring. The editor would be pleased to discuss proposals for simple observations with any member who has easy access to a rabbit colony so that regular visits can be made over an extended period.

There were fewer reports of Brown Hares *Lepus capensis* than had been received during the previous few years. The central area in which they had been reported as low in numbers appears to have spread. On the other hand, they have been more evident in parts of Breckland.

Rodentia

As late as 1974 a survey carried out by the Norfolk Young Naturalists and quoted in our 1975 report found a 4 to 1 ratio in favour of red as opposed to grey squirrels in Norfolk. Although even that particular research was limited in scope we have no comparable up-to-date data to compare with it, but reports suggest a very much more one-sided ratio now going the other way. The change from one species to another can be dramatically sudden. Until mid-summer, Red squirrels *Sciurus valgaris* could be seen in Thorpe Woods and extensions even to the edge of the old city of Norwich,

but sightings stopped and an increasing number of Grey squirrels *Sciurus carolinensis* were seen by large numbers of people. In their usual fashion in parks and on the fringes of built-up areas they are becoming quite bold. The grounds of Keswick Hall, which could almost guarantee good views of reds, is now very definitely grey territory. Thetford Forest still holds our largest red colony, which at the moment seems to be stable. Other notable pockets remain at Sparham, Smallburgh and Walsingham. The wider range of food acceptable to the grey means that much denser populations are normal with consequent damage to a greater variety of vegetation.

Voles seem to have been at a low ebb later in the year. However, one observer tells us anecdotes of both species. He watched a Bank vole *Clethrionomys glareolus* crossing a particular clearing on Salthouse Heath by climbing along bramble stems at a height of some 5 feet above the ground. He also describes the "ostrich-like" behaviour of the Short-tailed field vole *Microtus agrestis* which hid, frozen, under the three blades of grass which crossed over the middle of its back.

The individual mammals seen most often during the year must surely have been Water voles *Arvicola terrestris* that were watched by hundreds of the visitors following the Nature Trail to the Broadland Conservation Centre on Ranworth Broad. They were on view for much of the season and learned to tolerate quite a high level of human activity, which enabled them to give particular delight to many of the parties of children that visited the centre. 15 other sites were reported.

The Wood mouse *Apodemus sylvaticus,* as widespread as ever, was less plentiful as the year came to an end though they did provide their usual crop of stories. An example follows: "The East Tuddenham population continues to provide interest. This year they decimated a row of peas so subsequent plantings spent about half an hour in paraffin — a certain preventative. However, when the few peas left were pulled up, I found that they had been acting as a nurse crop for a row of Thorn Apple plants". One in Thorpe Hamlet, Norwich, nested at the bottom of a broken dust-bin under the plastic liner through which it made a foraging hole. Removal of the sack by the refuse collectors did not disturb the prospective parents enough to make them seek alternative accomodation. They were found when the householder's son went to position the new liner.

The Yellow-necked mouse *Apodemus flavicollus* is now well-established as a Norfolk species in its main site between Ellingham and Ditchingham along the Waveney valley and also at Forncett St. Peter. At the latter, at the close of the year, one was trapped after it had taken a fancy to feeding on a tablet of toilet soap.

8 sites for the Harvest Mouse *Micromys minutus* were submitted. A mammal enthusiast had the thrill of finding her first ever at Snettisham in November and only four days later finding another at Weeting. Both were dead. The other sites were: Calthorpe Broad, Brooke, Saxthorpe, Aldborough, Itteringham, Wymondham College and Griston. At Wymondham College the specimen was taken in a Longworth live trap.

Only five contributors mentioned the House mouse *Mus musculus,* but two of these spoke of high numbers. In Buxton, where they are common, "One in my larder, made a store of peanuts, ash keys (kept for planting), pieces of broken glass and three 1p pieces in a stoneware jar and plugged the top with chewed up paper, besides making a nest of shredded paper in the warm back of the freezer".

An unusual record of a Brown Rat *Rattus norvegicus* being killed by a weasel came from near Swaffham. One of our keenest regular contributors, Mrs. J. E. Gaffney, who travels extensively in the county, tells us that she found 107 road casualties during the year. This conpares with 125 in 1975, 61 in 1976 and 52 in 1977. The monthly breakdown for 1978 was as follows: Jan. 11, Feb. 11, Mar. 15, Apr. 13, May 9, June 1, July 3, Aug. 4, Sept. 15, Oct. 17, Nov. 6, Dec. 2.

The cold weather we have just endured may have made us forget that it was preceeded by a generally chilly year. The editor readily agreed that the rules should be broken to allow Dr. L. M. Gosling, Coypu Research Laboratory, to describe the total effect of the prolonged spell of cold weather upon the coypu population, so that his report, quoted in full, takes the cold year, 1978, and the very cold winter 1978/9 as a natural unit.

"During 1978 the coypu population continued to be affected by colder than average weather. The year started during a winter that was colder than any for seven years and ended with one that was the coldest since the exceptional winter of 1962/63. In spring 1979 the 13,000 coypus that were alive in early winter had been reduced by over 70% to some 3—4000 animals. This decline is expected to continue until July as the trapping effort depletes adults and juveniles remain in low numbers due to widespread mortality of young animals and almost universal abortion by adult females during the 1978/79 winter. This position will reverse during the summer when 80—90% of the surviving females are expected to litter within three months.

Since 1975 the trapping effort has deliberately concentrated on areas of high coypu density in an attempt to minimize the population increase that we know would occur in mild weather. As a consequence peripheral low density areas have been relatively neglected and some emigration has occurred. Lone males have been detected as far north as Grimsby and as far south as Foulness in recent years. However the recent discovery of a breeding colony to the south of Colchester and its proximity to the estuaries of the Stour and Blackwater adds a new dimension to this pattern of dispersal and one that is particularly significant because the colonists have survived the coldest East Anglian winter for 16 years".

Cetacea

A member who has visited the coast regularly for a very long period of years and recalls seeing porpoises leaping from the water on numerous occasions, tells us that he has not seen them for 5 years. There are obvious difficulties when live cetaceans are glimpsed and most of the positive identifications are of washed-up corpses. Common Porpoises *Phocoena phocoena* were found dead on the tideline at Titchwell during May and at Holme in September. A white-beaked Dolphin *Lagenorhynchus albirostis* was washed up at Titchwell during March. A double disaster to the Bottle-nosed Whale *Hyperoodon ampullatus* occured in August when a male drifted up the Nene as far as Wisbech. It was estimated at about 23 feet long. At the same time a 21 foot female was stranded at Laverton Marsh, Lincolnshire.

Carnivora

Although only one Red Fox *Vulpes vulpes* was seen on the Weeting reserve and on one central Norfolk estate fewer were killed than has been the case during recent years, other reports suggest that numbers in other districts are at the level that has become normal. A Badger *Meles meles* turning up at a long disused sett has provided some excitement in the east of the country. This does happen from time to time but is not neccessarily an indication that old setts will be reoccupied permanently by breeding pairs. Our remaining occupied setts seem, in the main, to be at least tolerated and at best protected by the landowners concerned, and this is, of course, the only way we will be able to retain the species on our list.

The Otter *Lutra lutra* is our other large carnivore that needs not passive but active protection. Its wide-ranging habits should, in theory, enable it to recolonise old territories but it is extremely unlikely that the county population could ever regain any

large proportion of its old ground. The provision of safe areas should be able to safeguard survival at a low level but the combined pressures of conflicting usages together with drainage and riverbank maintenance would not allow more. We are fortunate to have the Headquarters of theOtter Trust on our border as the enthusiastic field officers naturally look to our local river systems. They are doing invaluable work in contacting riparian landlords and discussing the problems with them. They are encouraged by the generally favourable responses they are encountering.

Of the small carnivores, Stoats *Mustela erminea* were numerous at Weeting and on Scolt Head a family of six arrived on 12th July and during the week that followed wrought havoc among the tern chicks. Stoats are fiercely single minded. On 1st August, two were seen fighting in the middle of the village at Itteringham. On 1st March, an adult stoat in Flitcham was seen to carry a young rat from a shed to the stoat's hole some 80 yards away. It returned five times to carry off the rest of the litter. The whole operation took about 20 minutes.

The Weasel *Mustela nivalis* that seized a starling by the leg at Caister St. Edmund found itself being attacked by other members of the flock. Two of them lifted it from the ground for a moment. They dropped the weasel and it released its intended prey.

A Ferret *Mustela furo* that escaped from its cage in Old Catton and took refuge in a neighbouring drain was featured in the local press and was subsequently reclaimed by its owner. More typical was its hutch-mate which also escaped but was not re-captured. Another was seen crossing the road near Swaffham and in all probability continued its feral existance. Ferrets and Polecat/Ferrets that are seen in the wild can cause confusion especially when the observation is a short one. An American Mink *Mustela vison* was shot along the mid reaches of the Wensum.

Controversy over the culling of seals and their further troubles caused by oil pollution and even by the detergent used to alleviate the latter featured in the local and the national press. These are emotive issues and cause a great deal of ink to flow and loosen many purse strings. They are all aspects of wider issues. To what extent we can include members of seal colonies is another debate and is touched upon by Percy Trett in the article that follows these notes.

Common seals are more likely to be found straying up-river than greys, but it was a grey seal *Halichoerus grypus* that was reported to have been seen at Denver Sluice on 17th November.

Artiodactyla

Small numbers of Red deer *Cervus elephas* were seen at scattered localities. There is growing concern that our Thetford Forest herd has passed its peak and that the downward curves of numbers and quality of its individual members may continue. It is a tragedy that the Forestry Commission should be prepared to encourage a magnificent herd of wild Red deer in the interests of conservation in the days when the public at large took very little interest, to go on to open up the forest rides in order to provide a public amenity, and then to see this living monument to an enlightened attitude wickedly abused.

Roe deer *Capreolus carpreolus* and Muntjac *Muntiacus reevesi* are more fortunate and the latter appears to be increasing in numbers.

Our other new small deer, the Chinese Water Deer *Hydropotes inermis* also seem to be doing well, apart from the set-back caused by the very cold winter. However, one that was found during the recent spring after it had probably succumbed during the freeze-up, provides a very good example of the less happy kind of report that is all too frequently received. "It had been wounded by a shot-gun earlier in its life. Among other horrors, it had pellets embedded in the skull and cartilage of the ear".

1973	East Winch Common	80	Gift	S.S.S.I.
1974	Sparham Pools	30	Agreement	——
1975	Pope's Drift	8	Agreement	——
1975	Wayland Wood	80	Purchased	S.S.S.I.
1977	Hockering Wood	200	Agreement	
1978	Syderstone Common	60	Leased	
1978	Lolly Moor	7	Purchased	

In addition, the Trust shares with the National Trust in the management of the costal reserve at Blakeney Point (1,335 acres), and it manages Arnold's Marsh, Cley (29 acres) on behalf of the National Trust.

By arrangement with the Nature Conservancy Council, Scolt Head Island, Ranworth Broad, Hickling Broad and the Breckland Heaths now form part of the National Nature Reserves.

*Status: N.N.R. denotes National Nature Reserve
S.S.S.I. denotes Site of Special Scientific Interest

† In 1966 Cley Reserve was established as a Bird Sanctuary under the Protection of Birds Act, 1954.

THE NORFOLK NATURALISTS TRUST

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Excellent bird watching facilities are available from 1st April to 31st October at Hickling Broad National Nature Reserve, Cley Marshes Bird Sanctuary, Holme Dunes Nature Reserve (self-contained flat available all year) and Broadland Conservation Centre, Ranworth. Reduced rates for members, party bookings and extended periods.

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Editor Dr E. A. Ellis

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THE HOGWEED SEED-CUP FUNGUS A NEW SPECIES OF *SYMPHYOSIRINIA*

by E. A. Ellis

Symphyosirinia E. A. Ellis *(Trans. Norf. & Norw. Nat. Soc.* 18, Part 3, 1-17: 1956) accommodates Helotiales which have primary and secondary conidial organs as defined for *Symphyosira* Preuss in the Moniliales. Until now, two species, *S. galii* E. A. Ellis and *S. angelicae* E. A. Ellis have been assigned to this genus. In August, 1968, apothecia associated with *Symphyosira parasitica* Massee & Crossland were found growing on the previous year's fallen fruits of hogweed *(Heracleum sphondylium L.)* on a largely bracken-covered valley slope at Bohuntine, Glen Roy, Inverness-shire, Scotland. The connection between the conidial and apothecial states was verified by subsequent production of conidial synnemata on new fruits inoculated with ascospores. Further collections of the fungus were made in the same locality in September, 1975. Although macroscopically this species much resembles *S. angelicae*, it differs markedly in the size of its ascospores and the size and multiseptate character of the conidia, while inoculation experiments have shown that host differentiation is distinct in the two fungi.

Symphyosirinia heraclei E. A. Ellis sp. nov. (Fig. 1)

Synnemata primaria sessilia, alba vel pallide rosacea; secondaria carnosa, clavata, 4-15 mm. alta. *Conidia* cylindrica, obtusa, primum hyalina dein pallide rosacea, (3) 5-7 (9)-septata, catenulata, (30)35-50(70) × 6-8 µm., haud setosa. *Apothecia* pallide brunnea, longe stipitata, cupulata, 3-5 mm. diam. ad 15 mm. alta. *Asci* cylindrico-clavati, 100-170 × 7-11 µm., 8-spori, poro iodo tincto haud caerulescente. *Ascosporae* primum uniseriatae dein biseriatae, ovoideae, hyalinae, 1-septatae (raro 2-septatae), (18)20-24 × 6-7 µm. *Paraphyses* cylindricae, 2-5 µm. latae. *Excipulum* prosenchymatosum. Habitat in fructibus dejectis Heraclei sphondylii. Holotypus 27 viii 1968 Herb. K.

Primary synnemata white to pale pink. *Secondary synnemata* flesh-coloured, clavate, 4 to 15 mm. high; both kinds of synnemata composed of closely-adhering, branching hyphae abstricting from their tips slimy phragmospores in basipetal succession. *Conidia* cylindrical, obtuse, at first hyaline then faintly rosy (sometimes yellowing with age), (3)5-7(9)-septate, (30) 35-50(70) × 6-8 µm., lacking setae. *Apothecia* pale brown, long-stalked, cup-shaped, 3-5 mm. in diameter, up to 15 mm. high. *Asci* cylindric-clavate, 100-170 × 7-11 µm., 8-spored, the pores not staining blue with iodine. *Ascospores* uniseriate, becoming biseriate just prior to discharge, ovoid, 1-septate (rarely 2-septate), hyaline, (18)20-24 × 6-7 µm. *Paraphyses* cylindrical, 2-5 µm. thick. *Excipulum* prosenchymatous. Parasitic on fallen fruits of *Heracleum sphondylium*.

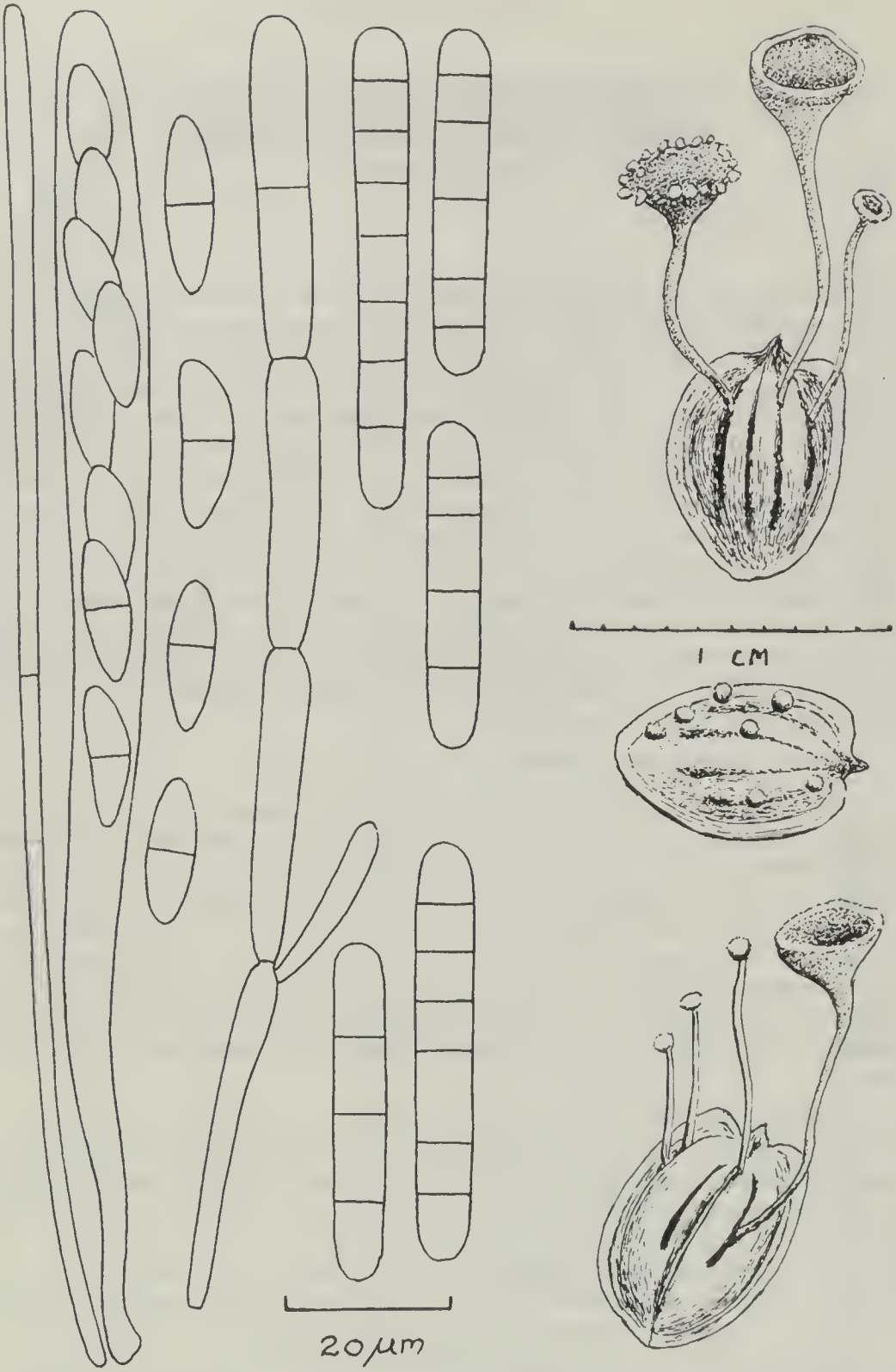

FIG. 1. *Symphyosirinia heraclei*. Paraphysis, ascus, ascospores, young conidial chain, conidia. Apothecia (including one with peripheral conidial masses), primary and secondary synnemata shown on right.

In this species, as in *S. galii* and *S. angelicae*, it is common for old apothecia to bear masses of conidia from the tips of their peripheral hypae after the ascospores have been liberated.

Massee & Crossland recorded *Symphyosira parasitica* growing on fruits of *Heracleum sphondylium* and *Conium maculatum*. In a series of inoculation experiments I have found that primary synnemata develop on fruits of *Conium maculatum*, *Heracleum mantegazzianum* and *Smyrnium olusatrum* inoculated with conidia of *Symphyosirinia heraclei*; but similar attempts failed with *Angelica sylvestris* and *Peucedanum palustre*, the usual hosts of *S. angelicae*.

In its type locality, *S. heraclei* occurs in a depression of a hill slope, c.450 ft O.D. adjoining a small burn which drains moorland meadowland; the soil is a brown, silty loam ('greasy' hill-wash) with good water-retaining capacity, in a part of Britain which has a high rainfall (40-60 inches). The host plant is locally abundant, with much *Galium aparine*, *Holcus mollis*, *Pteridium aquilinum* and *Rumex acetosa*, while *Stachys palustris* is of frequent occurrence. Other plants present in smaller numbers include *Achillea ptarmica*, *Arrhenatherum elatius*, *Atrichum undulatum*, *Brachythecium rutabulum*, *Cardamine pratensis*, *Centaurea nigra*, *Endymion nonscripta*, *Filipendula ulmaria*, *Lathyrus pratensis*, *Rumex obtusifolius*, *Trollius europaeus*, *Vicia cracca* and *Vicia sepium*. In view of the widespread distribution and abundance of hogweed in the British Isles it is remarkable that its fruits are so rarely parasitised by the cup-fungus here described. The limiting factors would appear to be ecological.

In my original account of *Symphyosirinia* I mentioned finding what appeared to be *Symphyosira parasitica* on fruits of *Pimpinella major* at Torr, Devon, 27 × 1956. A stock of this fungus has been maintained on the same host in my garden at Wheatfen Broad, Surlingham, for the past twenty-three years, but no apothecia have been found. The conidia are (3)4-5(7) -septate and 30-40 × 4.5-5 µm. Re-examination of the type collection of *S. rosea* Kiessler has shown the conidia to be 3-6-septate (commonly 4-5-septate) and 26-45 × 4-6 µm. Kiessler's specimens were gathered from woodland soil in the Austrian Tyrol and the abruptly truncated stipes suggest to me that they were originally attached to the buried fruits of a (most probably umbelliferous) plant, like those of the *Pimpinella* which I had to dig out with care from clayey hill-wash soil. In both cases the multiseptate conidia tend to be smaller and more slender than those of *S. heraclei* and their true specific status remains to be evaluated if and when apothecia are found.

I thank my brother, Dr M. B. Ellis for kindly checking spore measurements and suppying the drawings of microscopic details in Fig. 1.

A photograph of *S. heraclei* is reproduced in colour (plate 39) in *British Fungi*, Book 2, by E. A. Ellis: Jarrold, Norwich, 1976.

PLANT COLONISATION OF THORNHAM ISLANDS

by C. P. Petch, M.D., F.R.C.P. & M. C. Petch, M.D., M.R.C.P.

In 1934 Professor Steers, in discussing the origin of Scolt Head, drew attention to three small islands developing as off shore bars on the sand flats north of Thornham Harbour. In 1949 the main plants on these islands were *Salsola kali* and *Cakile maritima*, but by 1959 they had enlarged sufficiently to bear permanent dune vegetation. For the next twenty years, with few omissions, we have made annual lists of the plants colonising this new fragment of Norfolk.

By 1959 two of the islands had fused into one, so our lists refer to an eastern and a western one. Together they form a crescent some 500 yds from east to west, concave to the south, 60 yds wide at the maximum. Towards the western end of the crescent a channel through which the high tide flows separates the larger eastern island from the smaller western one. Dunes rise to about 15 ft on the eastern island at its widest part, slightly less on the western. The eastern end of the crescent is a shingle spit, curving towards the mainland. During the period of observation salt marsh has increased considerably between the islands and the mainland.

Constant species

Seventeen species appear in almost all our lists. *Ammophila arenaria*, the Marram Grass, is dominant on the upper parts of the dunes, *Agropyron junceiforme* on the lower slopes. A colony of *A. pungens* is established on the east island, and the hybrid, *A.* x *obtusiusculum* is also found. *Festuca rubra* var. *arenaria* is abundant on the stable dunes, and *Elymus arenarius*, the Lyme Grass, is always present but less common. *Salsola* and *Cakile* still persist, usually near the strand line, often with *Atriplex littoralis*. Scattered over the islands are *Atriplex hastata*, *Honkenya peploides* and sparse *Eryngium maritimum* (Sea Holly). *Suaeda vera* is permanently established on the shingle at the east end, and *Halimione portulacoides* spreads up from the salt marsh. Only three non-maritime species have established themselves. *Senecio jacobea* and *Rumex crispus* were on the larger island in 1959, and persist. On the smaller island, the former first appeared in 1966, and is still there, the latter not until 1979. *Sonchus arvensis* has been present on the larger island in every year bar three, and appeared on the smaller one in 1979.

Sporadic species

The table shows the occurrence of 42 species less constantly present. Five of these are maritime. *Atriplex laciniata* is an uncommon plant of the Norfolk strand line which has been noted five times. *Euphorbia paralias*, a west coast spurge rare in Norfolk, was found until 1966, and then no more. *Silene maritima* was only once seen after 1961, perhaps because the shingle

on which it prefers to grow was more deeply covered by sand. *Artemisia maritima* and *Beta maritima* spread at times from the salt marsh. All the rest are invaders from the weed flora of the adjacent mainland, often species with wind borne seeds, such as the many Compositeae and the Willow-herbs. The records suggest that they were commoner in the earlier years, when the dune vegetation was more open.

Table

E — east island, W — west island
Anagallis arvensis E 1959 only.
Aretium vulgare E 1960 only.
Arenaria serpyllifolia E 1978 only.
Arrenatherum elatius E 1960, 1965, 1979. W 1979.
Artemisia maritima E 1959, 1968.
Atriplex laciniata E 1959, 1961, 1963, 1977, 1978.
Bellis perennis E 1959 only.
Beta maritima E 1959 to 1962, 1965 to 1973.
Calystegia soldanella E 1961 only.
Capsella bursa-pastoris E 1969 only.
Chenopodium album E 1970 & 1972.
Cirsium arvense E 1960, 1961, 1963 to 1970, 1977 to 1979. W 1966 to 1975, 1979.
C. vulgatum E 1959 to 1961, 1963 to 1970, 1977 to 1979. W 1960, 1966 to 1969, 1979.
Conyza canadensis E 1959, 1960, 1965.
Crepis capillaris E 1959, 1960, 1962. W 1960.
Cynoglossum officinale E 1978. W 1979.
Cynosurus cristatus E 1960 only.
Epilobium adenocaulon E 1965 only.
E. angustifolium E 1965, 1968.
Erigeron acer E 1959 to 1962, 1970.
Euphorbia paralias E 1959 to 1962, 1965, 1966.
Galium aparine W 1979 only.
Hippophae rhamnnoides E 1966 seedlings only.
Lactuca virosa E 1960, 1965 to 1968, 1970. W 1969, 1979.
Leontodon taraxacoides E 1959 to 1961.
Lolium perenne E 1965 only.
Lotus corniculatus E 1965 only.
Pastinaca sativa E 1960 only.
Plantago coronopus E 1960 only.
Poa pratensis E 1959 only.
Polygonum avieulare E 1959, 1965. W 1960.
P. convolvulus E 1979 only.
Rumex conglomeratus E 1965, 1966, 1979.
Senecio vulgaris E 1959, 1960, 1965, 1966, 1968, 1972. W 1968.
Silene maritima E 1959 to 1961, 1968.
Spergularia marginata E 1965 only.
Sonchus asper E 1960, 1965 to 1969, 1978, 1979. W 1969, 1979.
S. oleraceus E 1959, 1960.
Stellaria media E 1979 only.
Taraxacum officinale E 1959 to 1961, 1965.
Tragopogon pratense E 1959 only.
Tripleurospermum maritimum E 1965, 1978, 1979.

Comment

It appears that the maritime vegetation of the islands is now undergoing little change. One might have expected the Sea Buckthorn *(Hippophae)* and Sea Spurge *(Euphorbia paralias)* to have spread, but the site may be still too mobile for the former, and the latter, though abundant at the western end of Scolt Head, is not widespread on the Norfolk coast. Failure of the majority of the immigrants from the mainland to persist is probably related to the salt spray that covers the dunes during winter storms. Thirteen of these have wind borne seeds which could easily be blown across the intervening salt marsh. Many of the rest are probably brought by human traffic, for the islands have become a favourite picnic place since the dunes grew tall enough to give shelter from the wind.

GEOMORPHOLOGICAL CHANGES AT BLAKENEY POINT, NORFOLK

by P. J. Barfoot & J. J. Tucker

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Introduction

Blakeney Point is the western end of a shingle spit that extends west from Cley on the north Norfolk coast, figure 1F. The botanical and geomorphological interest of the site were first described by Oliver & Salisbury (1913). Since then a succession of workers have studied the Point (see references). The area was acquired by the National Trust in 1912 and is part of the North Norfolk Coast Grade 1 Site of Special Scientific Interest (Ratcliffe, 1976).

Salisbury's (1922) classic work catalogued the series of westerly extensions to the headland, each the result of a shingle spur built out from the end of the Point, figure 1A-F. He counted 20 ridges and banks, numbering them westwards. Banks 2 and 19 have since disappeared, the former in a storm surge in about 1953.

This paper presents various of the published maps referred to above, and those made by members of successive Conservation course students from University College London. Figures 1 and 2 present 14 selected maps in two sets. Each set is to the same scale and orientation, so that developments are more clearly displayed. The first set, figure 1, comprises six maps, spanning four centuries, of the entire shingle spit. The second set, figure 2, focuses attention on the past half-century.

The Maps

Before the publication of the detailed map of the Point (Salisbury, 1922, figure 2A) maps of the area had been more general, to a smaller scale and of doubtful accuracy. Figure 1A-F reproduces a series of maps of which A(1586), B(1690) and C(1797) are from Hamond (1909). Because of the inaccuracy of A and B it has not been possible to reproduce then to a uniform scale and they are presented as direct reductions of pictorial maps. All parts of figure 1 are orientated with grid north vertical.

The sources of the eight later maps, figure 2A-H, are given on the captions. They are orientated with north vertical, with the position of the Lifeboat House at a common location in each frame and all are to the same scale. Where the precise location of the Lifeboat House was not given on the original map this has been estimated by alignment with the most constant features of the coast, for example bank 18 (Salisbury, 1922), see figure 1F.

Figures 2C-H are maps made from theodolite and plain table surveys by groups of students from the MSc Conservation course at University College London. Originals of these, which are completed approximately bi-annually,

are held in the Department of Botany and Microbiology at UCL. The surveyed outlines are variously of high water lines (HWMOST, figures 2A,B,C and part of F) or the interface of shingle with either mud or sand (SMI and SSI respectively, figures 2E-H).

The Changes

Figure 1 presents six selected maps of the entire shingle spit spanning about four centuries.

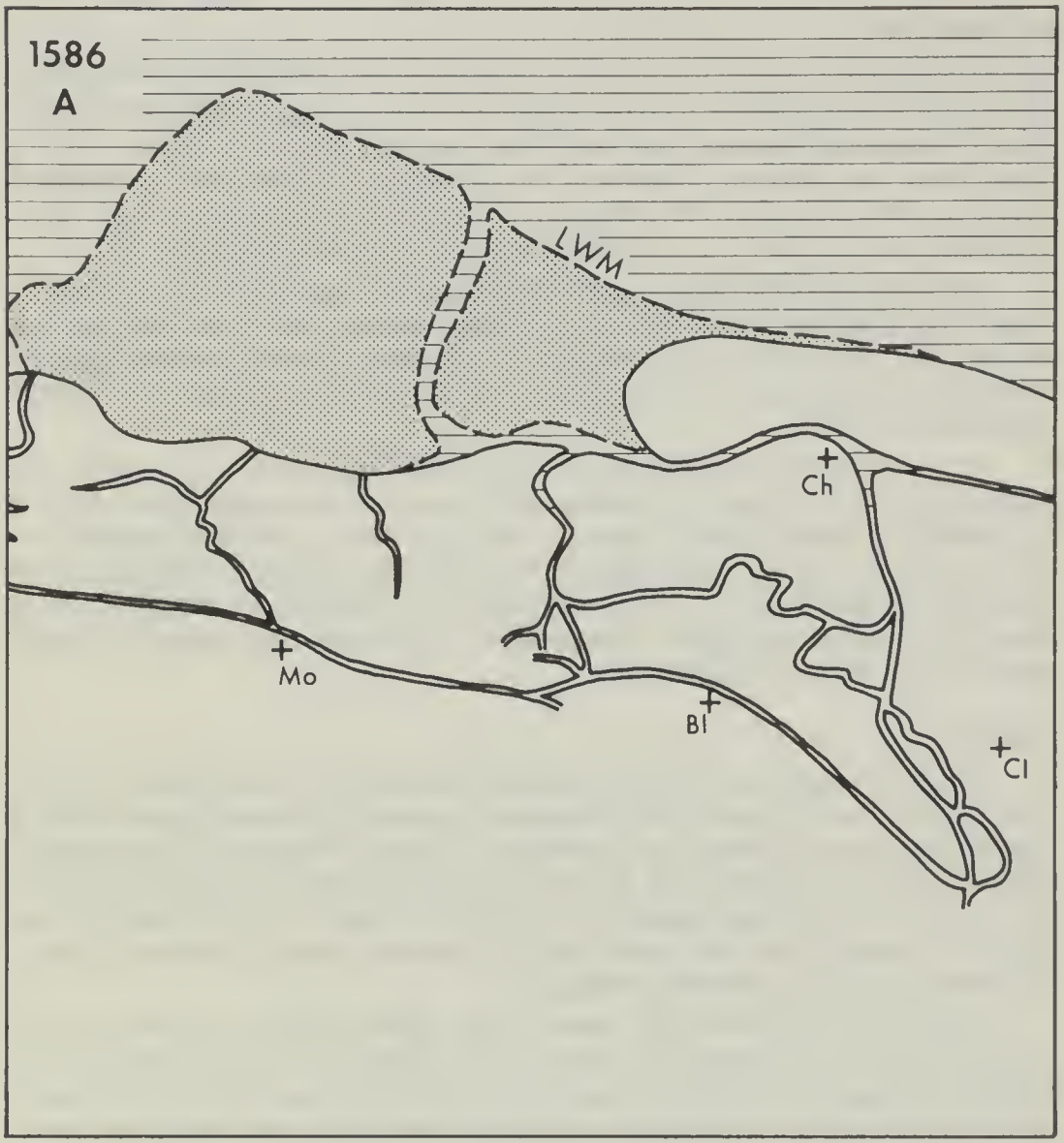


Figure 1A(1586). The original picture, rather than map, shows no reliable detail. However it is apparent that the peninsula extended north well beyond the chapel but not as far west as subsequently. The area deliniated is that marked on the Admiralty Survey as dry at low water. This margin moved c. 550 yards (503 m) landward between then and 1890 (Hamond, 1909).

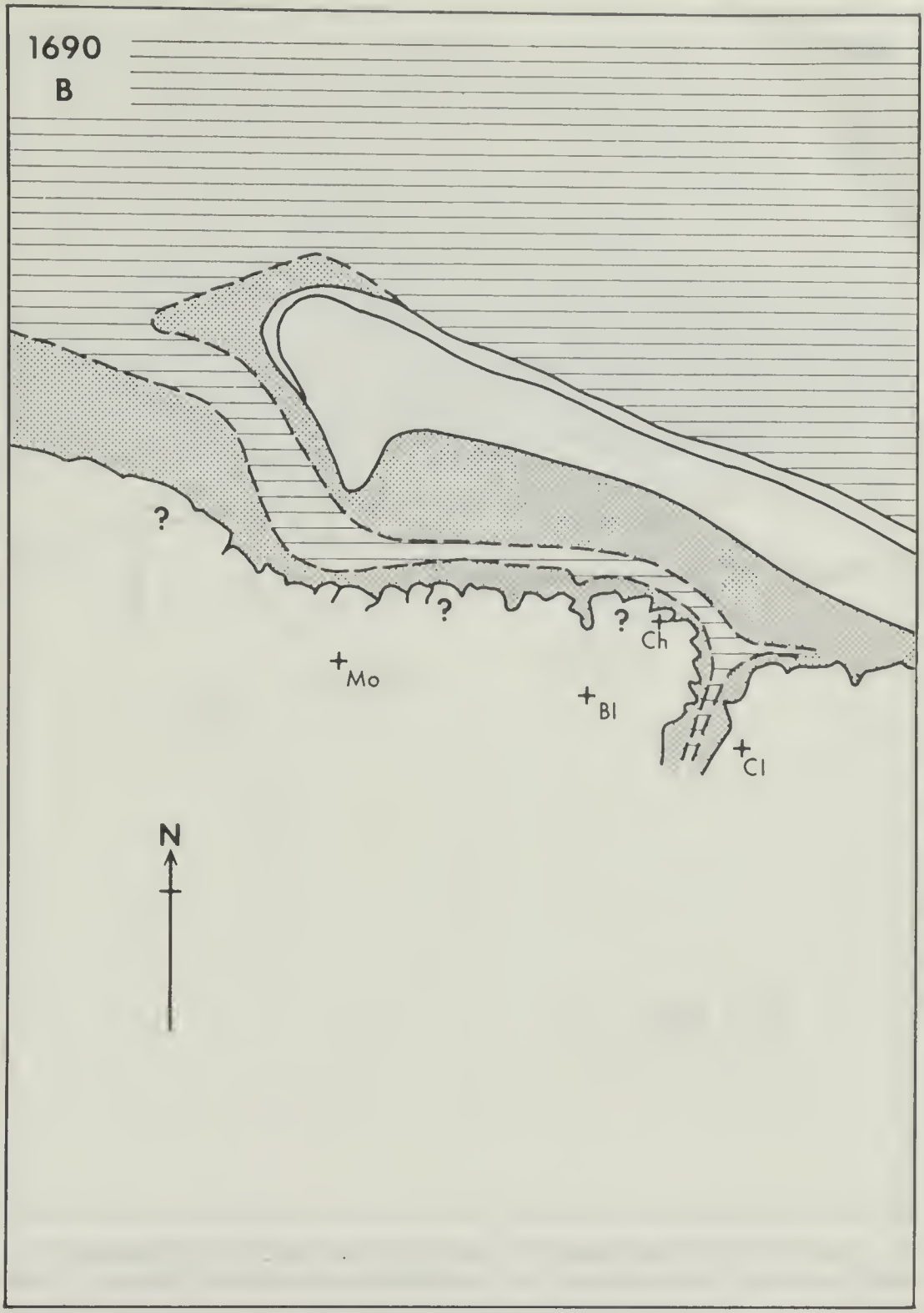


Figure 1B(1690). Again the original picture is not detailed. Nevertheless a considerable westward extension since 1586 is apparent and a terminal hook has developed. At this time Cley enjoyed direct navigational access to the sea.

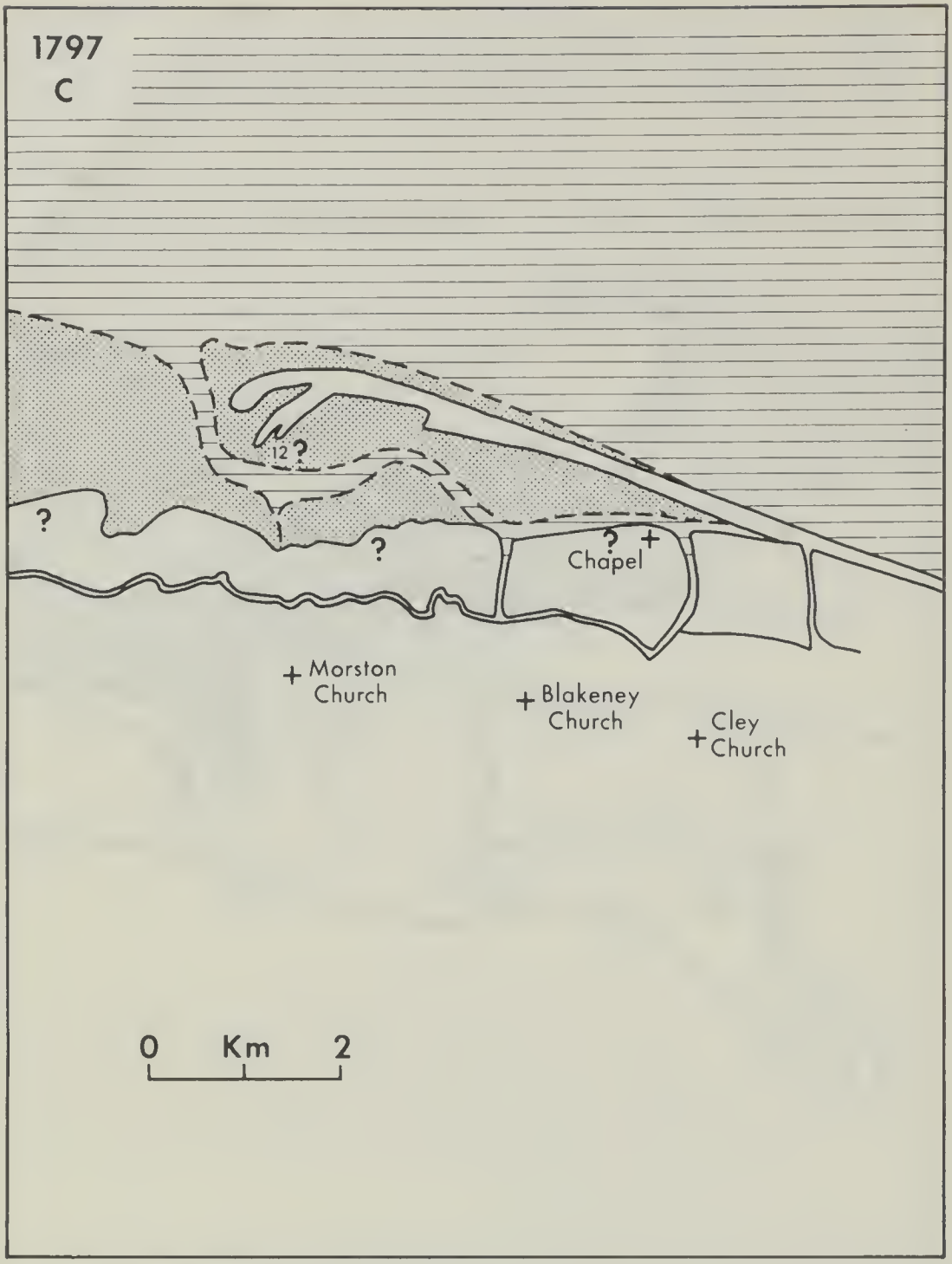


Figure 1C(1797). A further western extension to the complex is noticeable, as are the development of two headlands and a definite reduction in the width of the spit seaward of the chapel, cf. figure 1A. Clymo (1967) discussed this feature in detail and Cozens-Hardy (1929) suggested a move of 275 yards (252 m) in 275 years, based on a 1649 chart. By 1797 the low water mark had moved to a point c. 330 yards (302 m) landwards of the 1690 position Hamond, 1909).

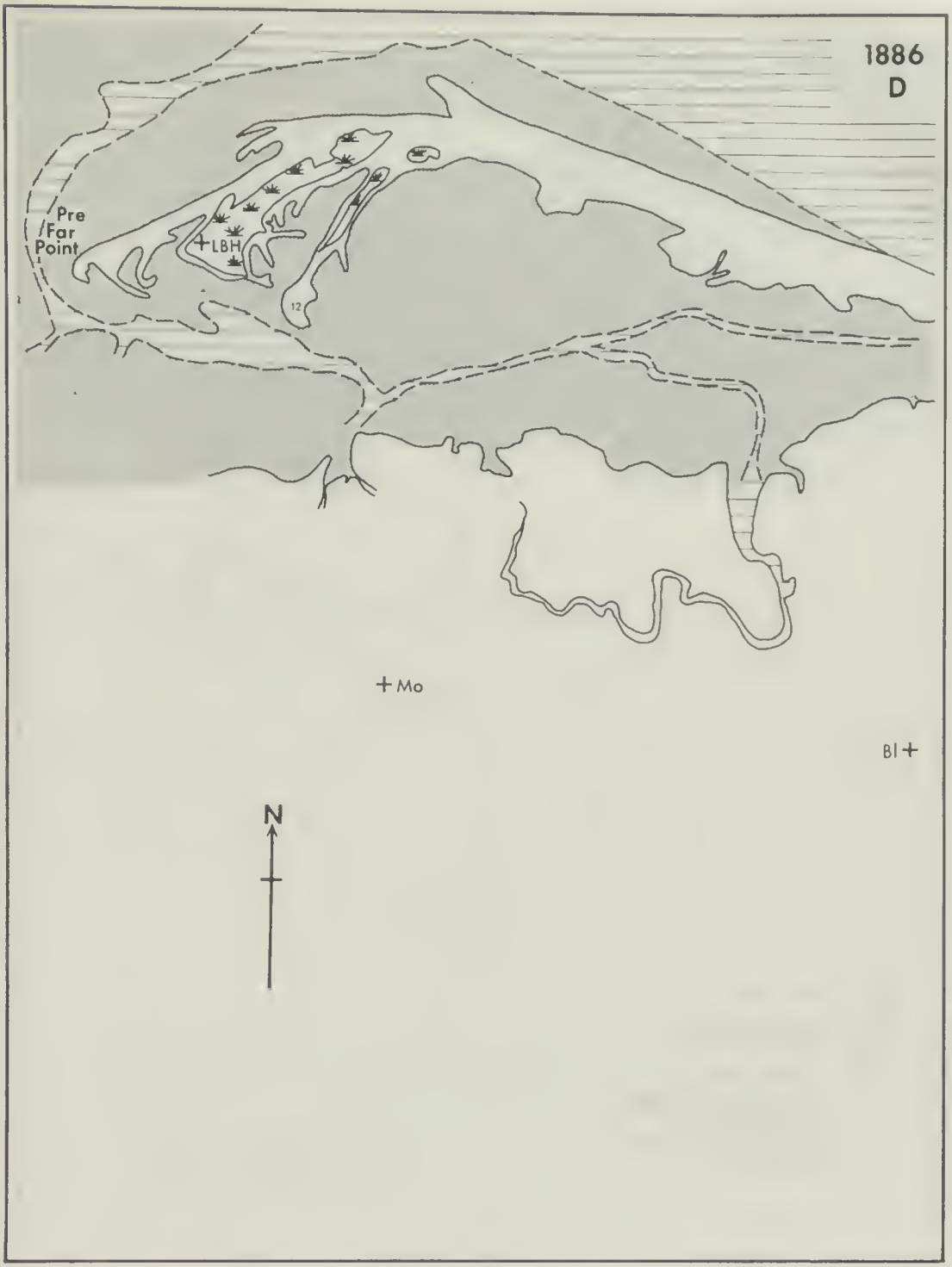


Figure 1D(1886). The headland has developed into a more substantial feature. Bank 12 (Salisbury, 1922) is apparent and may be the same as that shown in 1797. The promontory Pre Far Point (our name) was reported to have extended "a full half mile" (0.8 km) from the main headland prior to 1880 (Oliver, 1924a) but was almost completely swept flat by a NW gale on 29 December 1897 (Hamond, 1909) and the last traces of it had disappeared by 1907 (Oliver, 1924a).

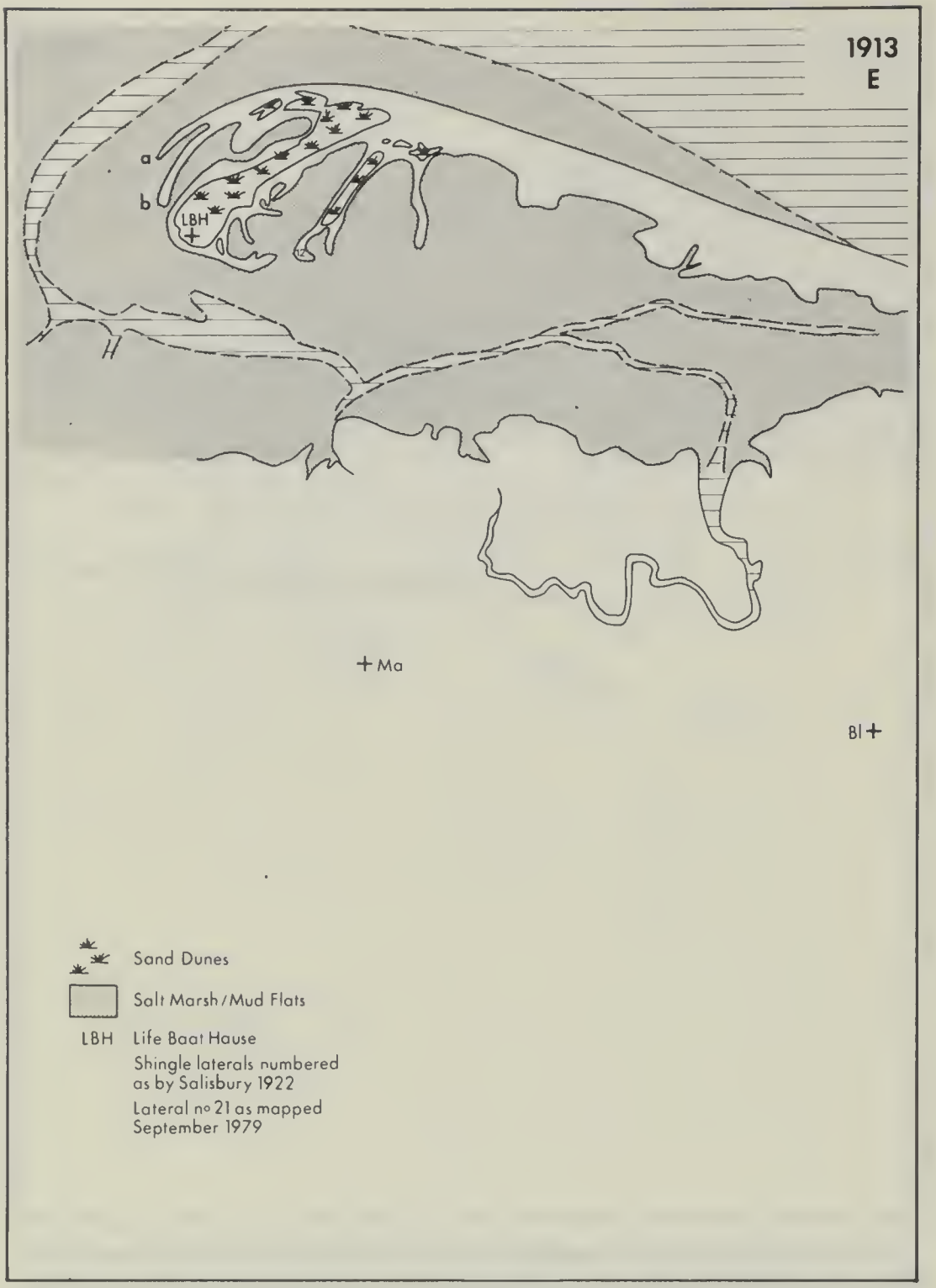


Figure 1E(1913). The now familiar form of the headland had appeared and the Lifeboat House site can be positioned. Headlands a and b (labelled as Oliver, 1924a) appeared after the winter of 1912/1913. These ridges were the precursors of the banks 18 — 20 of Salisbury (1922), ie. Far Point as it exists today.

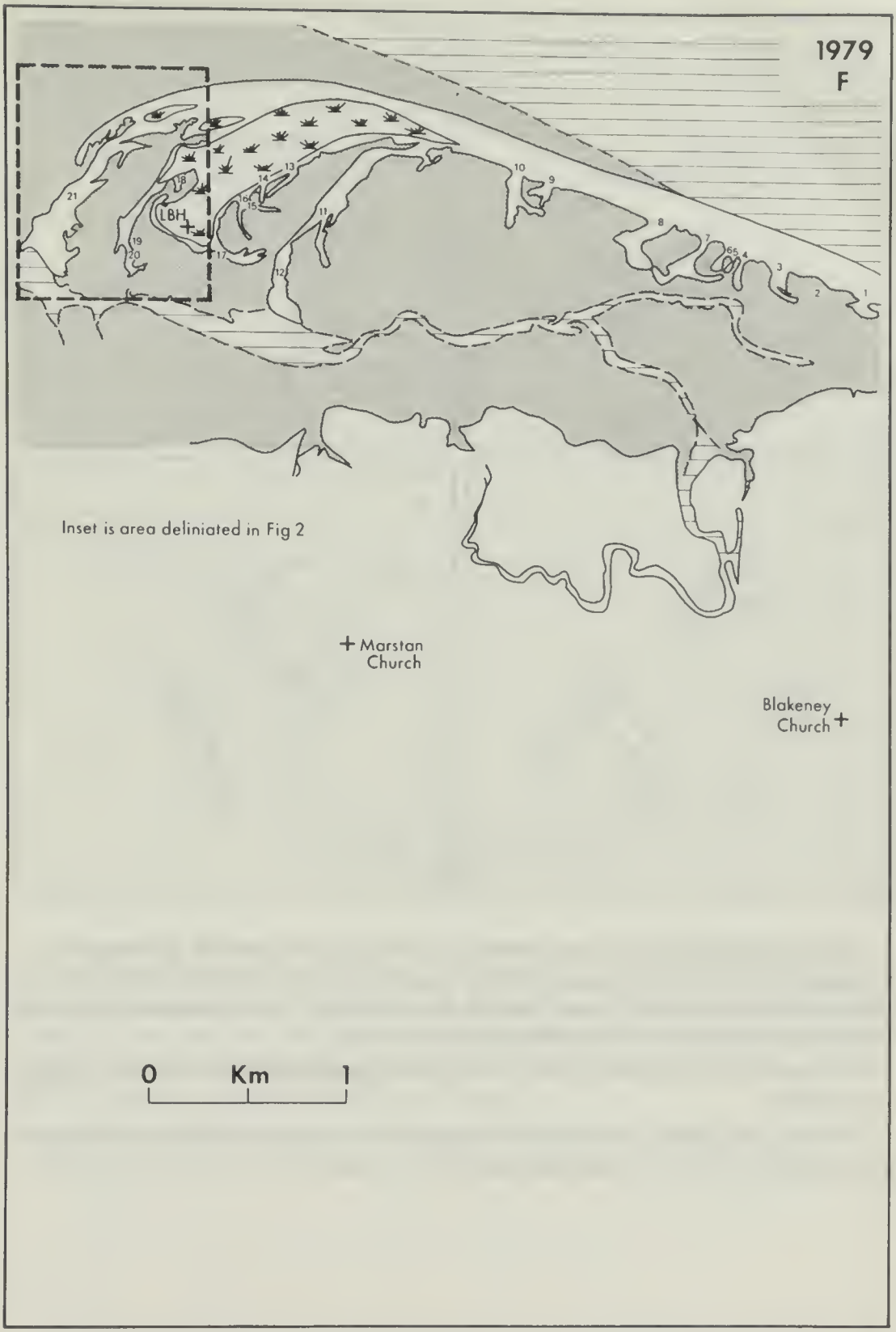


Figure 1F(1979). The whole shingle spit in 1979, with New Far Point (our name), which first appeared on maps as a shingle spit in 1966.

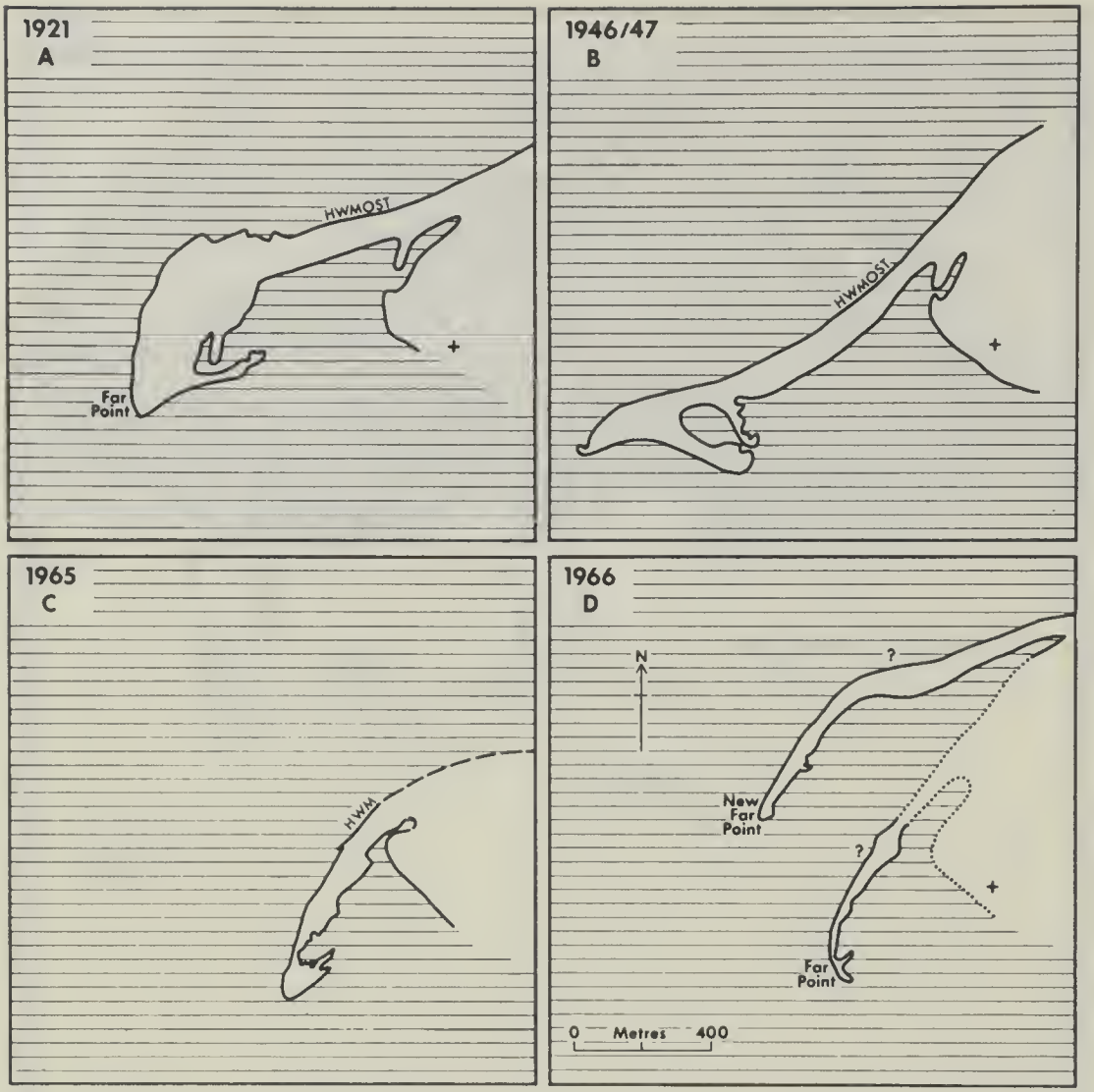
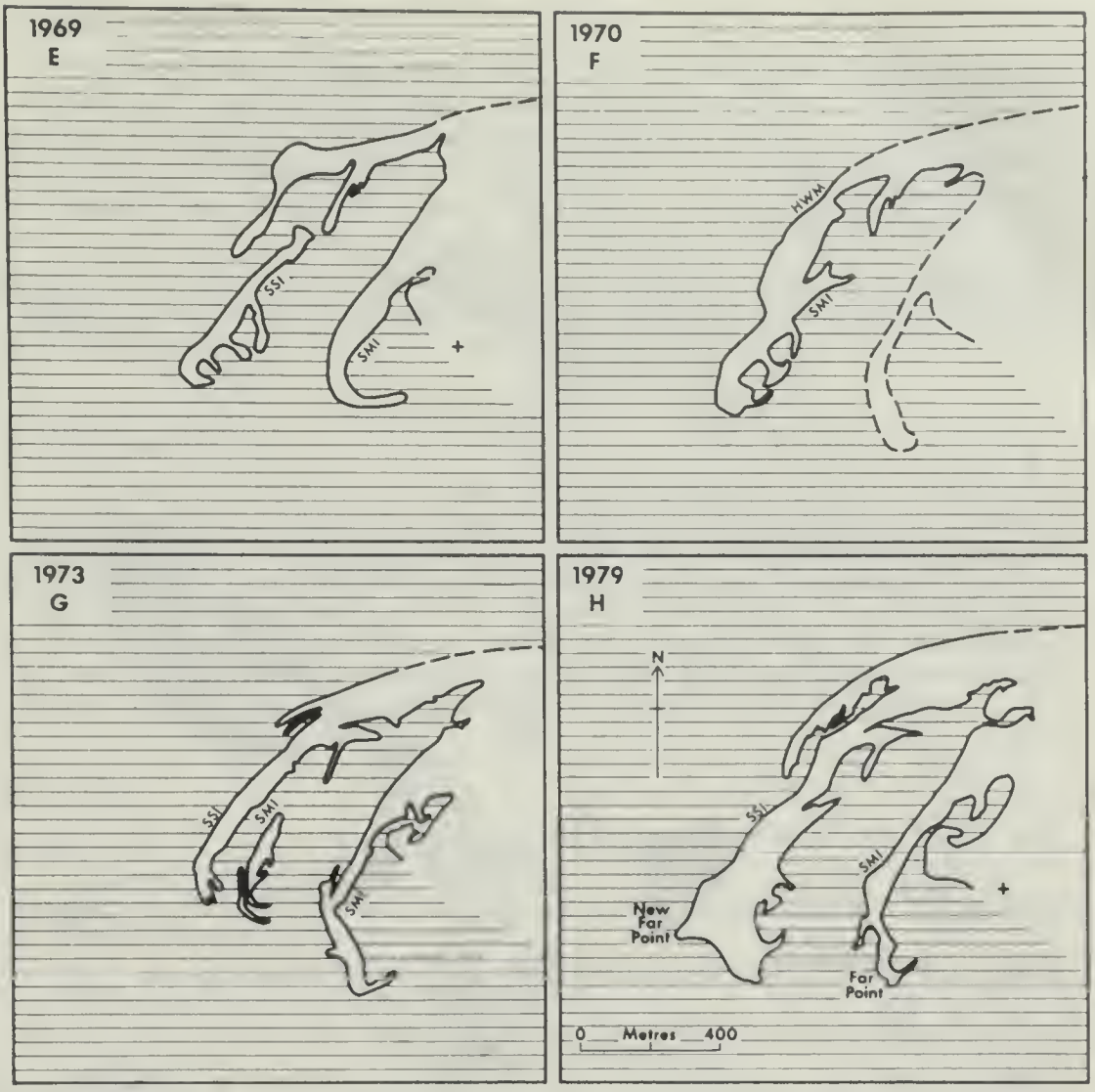


Figure 2A(1921). The promontories a and b of figure 1E, thrown up in the winter of 1912/1913, had extended south and west to form Far Point, in almost the same position as Pre Far Point, which was however produced directly from the coast SW of the Lifeboat House.

Figures 2B,C(1946/47,1965). Far Point changed shape and later size and orientation.

Figure 2D(1966). New Far Point appeared for the first time as a shingle spit. (It was visible on aerial photographs as a sand bank as early as 1955).



Figures 2E-H(1969-1979). New Far Point was consolidated, by stages, to its 1979 state. The storm of 11 January 1978 seemed to have a considerable effect elsewhere on the Norfolk coast (Steers *et al.* 1979) but had comparatively little effect on Blakeney headland (White, 1979). This continued accretion is in contrast to the speculation of Cambers (1975) that the drift at this site may no longer be from east to west.

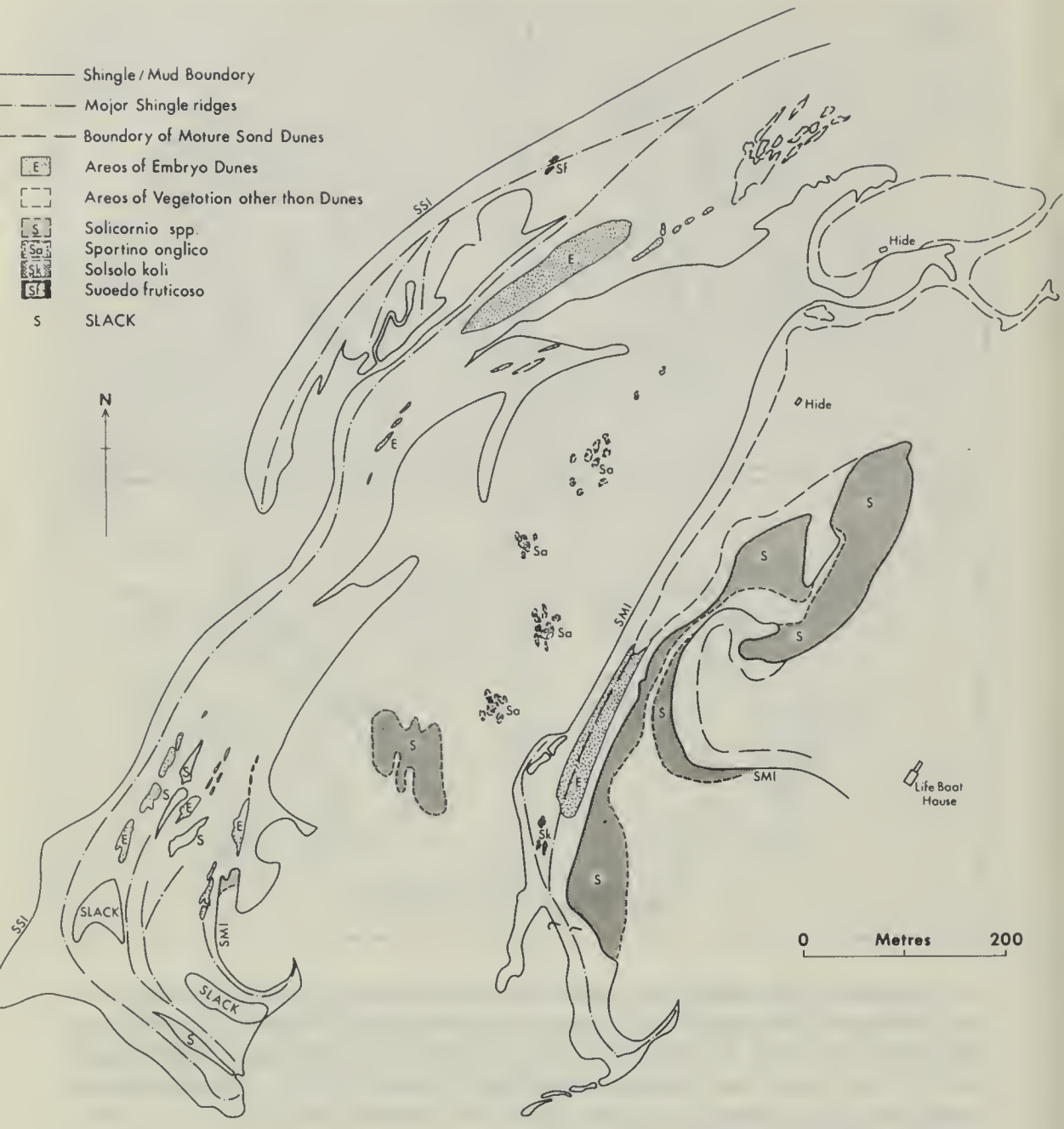


Figure 3(1979 - detail). The headland as it was in September 1979. Also shown are the locations of plant species important in the consolidation of the new systems.

Recommendations

We suggest that future maps of Far Point and New Far Point should have the position of the Lifeboat House surveyed onto them. This, along with scale and grid north, would allow direct comparability between maps. We also recommend that the interfaces of shingle with either mud or sand (SMI and SSI) be drawn onto all future maps of the area. This would result in a more accurate and comparable representation of the Point as both the HWM and strand lines are prone to considerable variation and cannot be retrospectively checked. New Far Point is numbered 21, concurrent with Salisbury's (1922) nomenclature, figure 1F.

Acknowledgements

We should like to thank Dr A. Warren for access to the maps of previous Conservation course students and for his comments on drafts of this paper. Dr F. B. Goldsmith organised the 1979 field survey and gave valuable help at all stages in the preparation. J.J.T. would like to thank Philip and Myrtle Radley for their assistance. Dr D. J. B. White kindly made comments on a draft. We should like to thank the 10 other participants of the 1979-1980 course for their help in the preparation of the detailed 1979 map. The National Trust kindly gave permission for us to work at Blakeney Point and the warden Mr E. Eales and his wife assisted us throughout our stay on the Point.

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Figure 1 A-C. Blakeney Point, 1586-1797. Maps from Hamond (1909). LWM, low water mark, date unspecified. ?, no mention made on original map as to line deliniated. Stippled areas represent sand banks and salt marsh. Linear scale applies to C only. The scales of A and B are unknown.

Figure 1 D-F. Blakeney Point, 1886-1979. Map D from Oliver and Salisbury (1913), E from Oliver and Salisbury (1913) modified by Oliver (1924a) and F from Steers (1947) modified by the authors. Laterals a and b on figure f after Oliver (1924a). Laterals numbered 2 and 19 no longer exist.

Figure 2 A-D. Blakeney Point, 1921-1966. Map A from Salisbury (1922) and B from Steers (1947). Maps C and D by University College London Conservation course. HWMOST, high water at mean ordinary spring tides. HWM, high water mark, date unspecified.?, no mention made on original map as to line deliniated. +, the position of the Lifeboat House, where given on the original. - - - -, detail added by present authors, for clarity. ...., detail of unsurveyed sections added by original authors.

Figure 2 E-H. Blakeney Point, 1969-1979. Maps E-H by University College London Conservation course. SSI, sand/shingle interface. SMI, sand/mud interface. HWM, high water mark, date unspecified. +, the position of the Lifeboat House, where given on the original. - - - -, detail added by present authors, for clarity.

Figure 3. Details of Blakeney Point, 1979, by University College London Conservation course, 10 - 15 September. _____, shingle/mud or shingle/sand interface (SMI and SSI respectively). -.-.-., major shingle ridges. - - - -, boundary of mature sand dunes. . . . ., areas of vegetation other than sand dunes.

LEPIDOPTERA IN CENTRAL NORFOLK 1979

by ALEC BULL

While the serious Lepidopterist makes use of the 'sugar patch', and necessarily invests in a Mercury Vapour lamp, the amateur can obtain quite a lot of pleasure in recording the species which come to an ordinary outside light. Over the years, quite a formidable list of species visiting a single 100 watt bulb on a corner of the house overlooking the upper Tud valley has been built up.

Following the desperately poor year of 1978, and the hardest winter for 16 years, 1979 has proved to be a record year, both in the numbers of species recorded, also in the number of species which had not been recorded here in in previous years.

The Early Moth, *Theria rupicapraria* appeared on time, on Feb. 27th, followed three days later by a Pale Brindled Beauty *Phigalia pilosaria*, in spite of the weather—severe frost, with snow showers on the intervening days.

However it was mid-April before many more species put in an appearance, with Northern Drab *Orthosia advena* and Small Engrailed *Ectropis crepuscularia* on the 15th, Water Carpet *Lampropteryx suffumata* on the 19th and Early Thorn *Selenia bilunaria* on the 20th. The same period saw the first Brimstone *Gonepteryx rhamni*, Small Tortoiseshell *Aglais urticae* and Peacock *Nymphalis io* butterflies on the wing in the garden, all on the 10th.

Late May, the 27th to be exact, brought both sexes of Muslin Moth *Cycnia mendica* to our notice. The male was found drying it's wings in the garden, while the female was discovered visiting the flowers of Bladder Campion *Silene vulgaris*, at dusk. Anyone interested in moths should have a few plants of this round the edge of the garden, as it proves more attractive to many moths than even the scented garden flowers.

The 20th of June saw the emergence of a whole host of common species such as the Heart & Dart *Agrotis exclamationis*, which were to be so prominent over the ensuing weeks.

A single Privet Hawk *Sphinx ligustri* was found on the 28th of that month, in a very battered state having apparently attracted the attention of one of the cats. The first Broad Barred White *Hadena bicolorata* came to the light that same evening.

A male Ghost Moth *Hepialis humuli* was dancing over a Lilac bush on July 6th, the first we had seen here in four years, though conditions would appear to be eminently suitable for it.

I was late up, on the evening of the 16th, and discovered at 23.15 that moths were swarming round the light. I stayed out until 1.30 next morning, and until 23.45 the following night, being rewarded by no fewer than 61

species identified, some in astonishing numbers. It was also remarkable that, though weather conditions were very similar on both evenings, numbers and species were in some cases very different. As an example, on the 16th, some three dozen Snouts *Hypena proboscidalis* appeared, on the 17th, only one or two, but five Drinkers *Philudoria potatoria* arrived, almost simultaneously, where none had been seen the previous evening.

Highlights of the two evenings, included many Buff Arches *Habrosyne pyritoides*, several specimens of the diminutive Round Winged Muslin *Thumatha senex*, several Coxcomb Prominents *Lophopteryx capucina* and two Maple Prominents *L. cuculina*. Two strikingly beautiful Garden Tigers *Arctia caja* contrasted sharply with a much dingier Triple Spotted Clay *Amathes ditrapezium*, and a sober coloured but attractively shaped Beautiful Hooktip *Laspeyria flexula*.

Another striking visitor which paid a brief call to the light on the 16th, was a Marsh Carpet *Perisoma sagittata*, which indicated to me that I have not found all the plants on the marsh below us yet, it's food plant being Meadow Rue, *Thalictrum flavum*.

July 29th brought a Lappet *Gastropacha quercifolia*, looking like a curled up Bramble leaf, while the 31st produced two female Leopards *Zeuzera pyrina* side by side on the wall, the first of several to be seen. As the early stages of this species are spent within wood, and it can take two or even three years to reach maturity, it is possible that I may not see it again yet awhile.

August had its usual array of rather drab looking Noctuids, but was punctuated with a few 'nice' species. Ruby Tigers *Phragmatobia fuliginosa* were of nightly occurrence throughout the month; Oak Hooktip *Drepana binaria* first appeared on the 12th, and the Herald *Scoliopteryx libatrix* next day. The 19th was another red letter day, with the first Peppered *Biston betularia*, and, as is most usual nowadays, the var. *carbonaria*, and my first Swallow Prominent *Pheosia tremula*.

The month ended with a Feathered Gothic *Tholera popularis* on the 28th, and an Olive *Zenobia subtusa* on the 31st.

The first new species in September did not appear until the 9th, when several Dusky Thorns *Deuteronomos fuscantaria* arrived. The same evening brought a Centre Barred Sallow *Atethmia xerampelina*.

Three more of the lovely Sallow tribe appeared within the next ten days. The Sallow *Cirrhia icteritia*, the Dusky Lemon Sallow *C. gilvago* and the Barred Sallow *Tiliacia aurago*.

The first half of October almost completed the expected numbers of moths to emerge, with many Feathered Thorns *Colotois pennaria* and Figure of Eights *Episema caeruleocephala*, one or two Streaks *Chesias legatella* and Green Brindled Crescents *Allophyes oxyacanthae*, and one more new species to end the year: a Sloe Carpet *Bapta distinctaria* on the 10th. With the first December Moth *Poecilocampa populi* on Oct. 15th, there only remained the Winter Moth *Operophtera brumata* to round off the year, at the light.

Butterflies also had their best year for a long time, though the big September emergence of Small Tortoiseshells and Peacocks suffered predation when the Buddleia became surrounded in mid month by no fewer than 7 Spotted and one Pied Flycatcher! The last Spotted Flycatcher left on the 28th, his final meal being our resident male Brimstone!

The only Comma *Polygonia c-album* did not appear until two days later, and spent much of October looking for rotten fruit in company with two Red Admirals *Vanessa atalanta*.

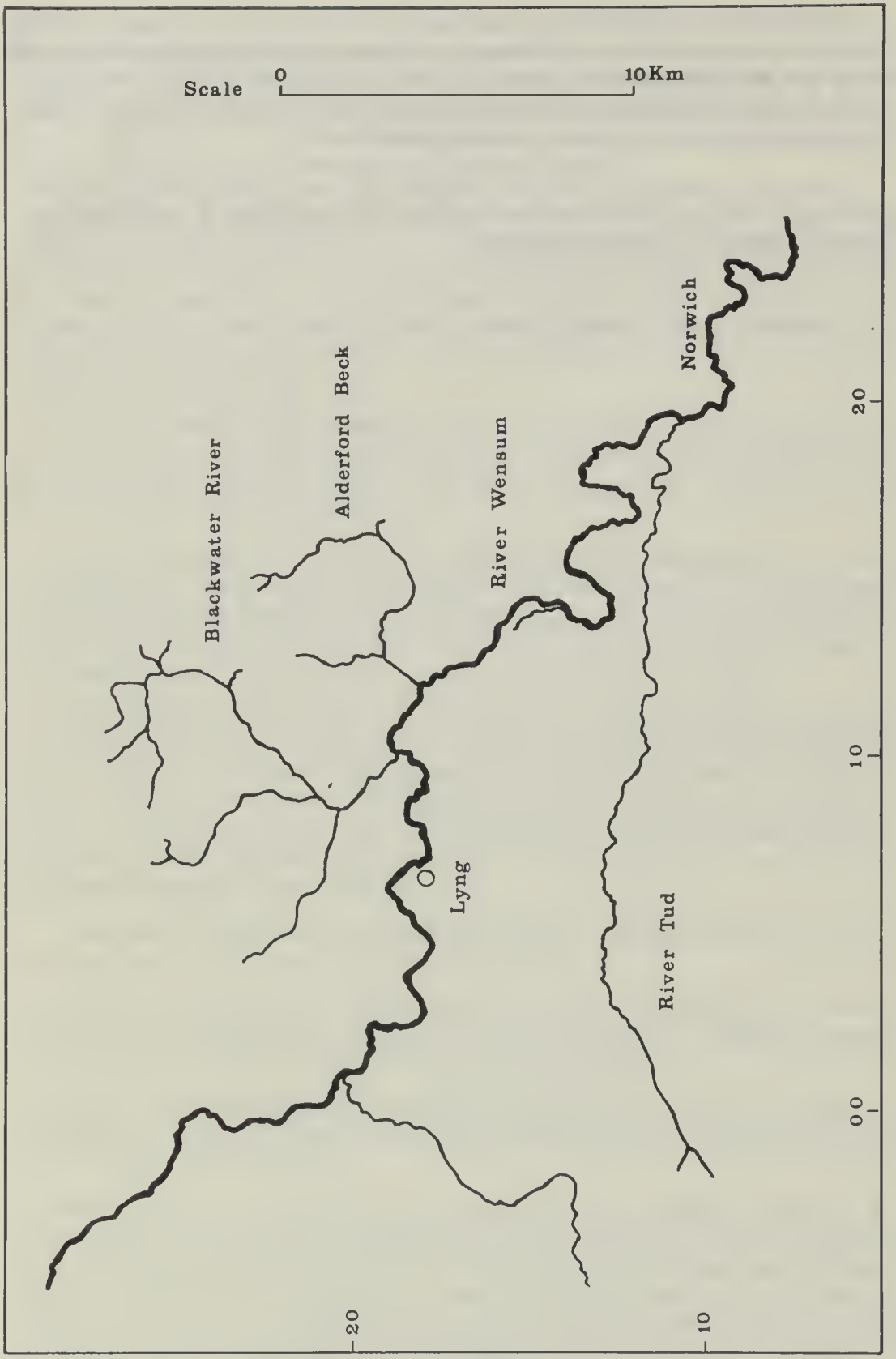


FIG. 1 Map of the lower reaches of the River Wensum.

THE RIVER WENSUM (2)

by Roy Baker and Peter Lambley

The present paper is a continuation of the study undertaken in 1977 to follow the River Wensum from its source to its confluence with the River Yare at Norwich and to survey both the flora and fauna of the waterways and river valley. In a previous paper (1978) the river from above Fakenham downstream as far as Lyng was described and the present paper completes the survey to the lower reaches at Norwich.

Geology

The geology of the Wensum valley below Lyng is similar to that of the upper reaches with Senonian Chalk underlying the whole valley but outcropping rather more along the valley sides. This chalk is overlain with drift deposits, mainly boulder clay, near Lyng and Lenwade. These deposits become more sandy-gravelly further east. The river flows on a bed of alluvium with terraced gravels above. Below Attlebridge it flows through a series of well developed incised meanders which possibly follow a periglacial channel. The River Tud has a straighter course flowing over boulder clay until east of Honingham where it flows over sands and gravels. Chalk outcrops occasionally and the river is mainly fed from run-off from drift deposits, except near Dereham where chalk springs occur.

The gravel deposits in the Wensum valley are being, or have been, worked at Lyng Easthaugh, Lenwade and at Costessey.

Land Use

The low lying alluvial lands of the Wensum as far as Hellesdon are principally used as pasture or meadow cut as hay. Gravel workings are of importance for angling and recreational amenities. Below Hellesdon urban pressures for housing, industrial building and recreation affect the river.

The Anglian Water Authority has developed a number of lagoons in the marshes near the junction of the Rivers Wensum and Tud for fish conservation. Water extracted from the Wensum is passed through the lagoons before returning to the Tud. The lagoons have a twofold value in allowing for the production of coarse fish (roach, tench, rudd, carp) by natural reproduction and in acting as fish reservoirs for rescue operations. Recently 15,000 bream were temporarily maintained in the lagoons from Haveringland Lake.

Survey Methods

The Wensum was surveyed for a distance of 32km downstream from Lyng bridge during 1978-79. Some of the major tributaries and dykes associated with the river were also surveyed. The sampling methods are described in the earlier paper by Baker, Driscoll and Lambley (1978).

River Wensum. The River Wensum leaving Lyng meanders through low lying hills. The banks are enclosed by grazed water meadows with alder-willow copses. Near Walsis Hill the main channel is dominated by perfoliate pondweed *(Potamogeton perfoliatus L.)*, spiked water milfoil *Myriophyllum spicatum* L.) and Canadian pondweed *(Elodea canadensis* Michx.). Water crowfoot *(Ranunculus fluitans* Lam.), a plant requiring a stable substrate and a large volume of water for good growth, first appears in the river at this site. Dr E. A. Ellis (pers. comm.) recorded the plant in flower near Lenwade Common in 1972. At Lenwade Common the dominant macrophytes are perfoliate pondweed and arrowhead *(Sagittaria sagittifolia* L.). The banks are crowded with reed, orange balsam, great hairy willow-herb and nettles. Freshwater molluscs are extremely abundant, especially *Potamopyrgus jenkinsi* (Smith), *Bithynia tentaculata* (L.), *Valvata piscinalis* (Müller) and *Sphaerium corneum* (L.). The ear pond snail *(Lymnaea auricularia* L.) appears in the river for the first time at Lenwade. A single specimen of the parasitic fish leech *Hemiclepsis marginata* (Müller) was taken at Lenwade. This brightly coloured green leech with its seven rows of yellow dorsal spots is comparatively rare in Norfolk. It is a leech of standing waters and slowly flowing rivers such as the Wensum.

In the river terrace below Walsis Hill there is an extremely productive ditch where frog-bit *(Hydrocharis morsus-ranae* L.), hornwort *(Ceratophyllum demersum* L.) and stonewort *(Chara vulgaris* L.) are very common. In many places the duckweeds *Lemna minor* L. and *Lemna trisulca* L. cover the surface of the water. The water-boatman *Notonecta glauca* L., the pond-skater *Gerris lacustris* L. and the water bug *Hesperocorixa linnei* (Fieb.) occur in the ditch.

Below Lenwade Mill the river is moderately fast flowing with occasional shallow gravelly beds. A number of obstacles placed in the river produce an increased turbulence. The dominant macrophytes include perfoliate pondweed, spiked water milfoil, horned pondweed *(Zannichellia palustris* L.) and bur-reed *(Sparganium erectum* L.). A number of interesting water beetles were collected from the quieter waters of the river below Lenwade. *Agabus bipustulatus* (L).), *Agabus sturmii* Gyllenhal, *Potamonectes depressus* (Fab.), *Haliplus lineatocollis* (Marsham) and the ubiquitous *Haliplus fluviatilis* Aubé. Balfour-Browne (1905) noted that both species of *Agabus* were common in the Rivers Ant and Bure as well as in a number of broads. *Agabus bipustulatus* was taken in the head waters of the Wensum in 1977 but the record for *A.sturmii* at Lenwade is the first for this species in the present survey. Balfour-Browne (1950) observed that *A.sturmii* prefers stagnant water, whether fresh or peaty, and although not a running water species it occurs commonly in slow-flowing drains and dykes on salt marshes.

Between Attlebridge and Attlebridge Hall the Wensum is fast flowing over hard sandy-gravelly beds. Perfoliate pondweed and arrowhead are the dominant macrophytes. The river banks are grazed by cattle and there is little marginal vegetation. Buckley (1975) noted that the edible frog *(Rana esculenta* L.) was introduced into ditches at nearby Morton Hall in 1837, 1841 and 1842

and that these dispersed to ponds at the top of Honingham Heights. Buckley considers it unlikely that they still exist in the locality. At Attlebridge Hall there is a ford where the river becomes very shallow and flows over gravel beds with horned pondweed, perfoliate pondweed and willow moss *(Fontinalis antipyretica* Hedw.), but below the Hall the river deepens again and the flow slows down. At Ringland a large drain, known locally as the Arch Drain, enters the river from Ringland Common.Water flow in the drain is extremely slow and prior to a September dredging the depth rarely exceeded 0.5m. The water fern *(Azolla filiculoides* Lam.) formed dense mats at the junction of the drain and the river. Ellis (1956) has traced the history of this alien plant in Norfolk from its first introduction into a pond at Chapel Field Gardens, Norwich in 1903 and its subsequent spread throughout the lower Yare valley. The record at Ringland Common is the first one for the species in the Wensum above Norwich, although it was found in a pond at Costessey Common by E. A. Ellis in 1973 and 1974. The abundance at Ringland in the drain suggests a recent introduction with a subsequent spread down river to Norwich. In the Wensum the water fern proved to be widely distributed both in the river and associated ditches below Ringland to the middle of the city.

The steeply sloping Ringland hills form a narrow valley for the Wensum where reed, reed sweet grass and the great pond sedge dominate the banks with an encroaching scrub of alder, willow and poplar. Holiday chalets on one side abutt the river and there is some development of the river banking with boat bays. The co-dominants in the river are the perfoliate pondweed, yellow water lily *(Nuphar lutea* (L.) Sm.) and the arrowhead, the latter species being closely associated with silty substrates. Near Costessey Common the river is bordered on the northern side by fairly steeply sloping land but on the opposing bank the flat alluvial plain has been deeply scarred by gravel workings. The intensive grazing of the pastures on the northern slopes allows for little diversity in the plant communities but on the Costessey Common side the land is overgrown and botanically interesting. Arrowhead decreases in dominance in the river and is partially replaced by *Sparganium emersum* Rehm. At Drayton Bridge the bank and marginal vegetation is rich and includes *Glyceria maxima* (Hartm.) Holmberg, *Bidens cernua* L., *Lycopus europaeus* L., *Eupatorium cannabinum* L., *Pulicaria dysenterica* (L.) Bernh., *Impatiens capensis* Meerburgh, *Veronica beccabunga* L., *Stachys palustris* L. and *Scrophularia aquatica* L. One kilometre below the railway bridge there are some particularly well developed deep water communities in 3-4m of water where *Sagittaria sagittifolia, Elodea canadensis, Myriophyllum spicatum, Oenanthe fluviatilis* (Bab.) Colem. and *Ceratophyllum demersum* grow together in dense beds of vegetation. *Ceratophyllum demersum* has neither roots nor rhizomes and its submerged shoots can only maintain their positions in sites where the river flow is negligible, such as these deep water communities in the Wensum. Above Hellesdon weir much of the northern bank of the river is developed by extended gardens with boat bays and river piling. The opposing bank remain under-developed and overall the river conserves much of its beauty and natural history interest.

Immediately down river of the weir at Hellesdon the Wensum is joined by the smaller tributary of the Tud. Initially the turbulent waters flowing

over the weir rush over stones and coarse gravels but the movement of the water soon slows and a silty-gravelly bottom develops. In the deeper waters *Sagittaria sagittifolia* and *Potamogeton perfoliatus* are the dominant macrophytes, although nearer the banks *Myriophyllum spicatum* and *Elodea canadensis* form dominant communities. Yellow water lilies cover a number of sites with their broad surface leaves. The pressures of suburban developments have produced some landscaping of the river banks at Hellesdon and Costessey where open parkland gives access to the river. Allotments border parts of the river, although many low-lying areas retain their reed swamp coverage. The marshes and ditches bordering the river near Sweet Briar Road contain communities of water violet *(Hottonia palustris* L.) and frog's bit *(Hydrocharis morsus-ranae* L.). Buckley (1975) reported the release of marsh frogs *(Rana ridibunda* Pallas) in these marshes in 1960 but subsequent searches have failed to find any survivors. Near the City Waterworks *Glyceria maxima* and willows dominate the banks. The river is rich both in plant species and in vegetation cover. *Sagittaria sagittifolia* and *Potamogeton perfoliatus* are co-dominants, whilst *Nuphar lutea, Oenanthe fluviatilis, Elodea canadensis, Myriophyllum spicatum, Callitriche* sp. *Ceratophyllum demersum, Apium nodiflorum* (L.) Lag. and the algae *Cladophora* sp. and *Enteromorpha* sp. are all common. Willow moss is commonly found attached to stones and the floating duckweed *Lemna minor* and the water fern frequent the still waters near the banks.

The presence of Norwich Waterworks has an extremely beneficial affect on the Wensum since all powered boats are prohibited upriver from the inlet pipes and pollution is minimal. The extraction rate of water from the river is approximately 48000 cubic metres per day. Kitton (1877 and 1884) collected a number of interesting algae from the Norwich Water Company Supply. These included *Diatoma elongatum* (Ag.) and *Asterionella elegans* (Heiberg). Collections made by the staff of the waterworks in recent years have included species from the following genera.

Chlorophyceae	*Scenedesmus*	*Chlorella*	*Pediastrum*
	Coelastrum	*Volvox*	*Eudorina*
	Chlamydomonas	*Microspora*	*Spirogyra*
	Oedogonium	*Closterium*	*Cosmarium*
	Zygnema		
Bacillariophyceae	*Cyclotella*	*Stephanodiscus*	*Tabellaria*
	Diatoma	*Synedra*	*Fragilaria*
	Navicula	*Pinnularia*	*Cymbella*
	Nitzschia		
Myxophyceae	*Oscillatoria*	*Aphanizomenon*	

A single specimen of the flatworm *Bdellocephala punctata* (Pallas) was collected near the waterworks. Reynoldson (1967) reported the species from the Norfolk Broads and several individuals have been taken in the River Yare at Keswick Mill since 1970 by one of the authors (RB). *Dugesia tigrina* (Girard) is an American immigrant species almost certainly introduced into the U.K. through the aquarium trade in fish. A few specimens were collected at Ringland in the present survey but as one nears the city the numbers of this flatworm increase dramatically. It is an extremely common species in the

river above New Mills. Reynoldson (pers. comm.) notes that it has been reported from rivers in Britain since his 1967 distribution maps were published. Its invasion of the River Wensum to Ringland is of considerable interest.

In his summary of the non-marine mollusca of Norfolk Mayfield (1909) noted eighteen species in the River Wensum between Costessey and New Mills. The present survey has shown that the river remains rich both in species abundance and diversity. One important species that is now absent is the glutinous snail *(Myxas glutinosa* Müller), which was first recorded by Bridgman in 1872 at Heigham (the river above New Mills) as being 'periodical in appearance'. Mayfield also noted the species at Hellesdon. This rare water snail was originally known from three sites in Norfolk but it has not been noted since 1950 in the county (Kerney, 1976). Bridgman (1872) also discovered the only British species of neritid found in freshwaters, *Theodoxus fluviatilis* (L.), at both Hellesdon and Heigham. In a later paper (1896) he described two varieties, var. *pallida* (Pascal) and var. *trifasciata* (Colb.), in the Wensum near the waterworks. Below Hellesdon weir the snail still survives on the underside of stones. It is restricted in its range of habitats to those of high calcium content where stones and sunken wood afford some protection from currents and light. Many suitable stone habitats remain in the Heigham reach of the river and more careful searching will probably show the continued presence of the neritid in these waters.

Daniels (1960) studied the caddis flies from the river above New Mills from 1938 and he noted that the weir formed a kind of barrier — upstream there was a wealth of caddis life and downstream very little, although two common species, *Anabolia nervosa* (Curtis) and *Halesus radiatus* (Curtis), occurred regularly and *Polycentropus flavomaculatus* Pictet bred regularly near St. George's Bridge inspite of pollution. No attempt was made to repeat the detailed work of Mr Daniels but in a personal communication Mr Daniels considered that the caddis fly fauna had declined over the succeeding years in the Wensum valley.

TABLE 1. Showing the changes in the molluscan fauna of the River Wensum between Costessey and New Mills over the period 1872 to 1978.
Key: * = present in river
d = present in ditches

	Bridgman 1872	*Mayfield 1909*	*Present Survey 1978*
Theodoxus fluviatilis (L.)	*	*	*
Viviparus viviparus (L.)		*	
Viviparus contectus (Millet)		d	*
Valvata piscinalis (Müller)		*	*
Potamopyrgus jenkinsi (Smith)			*
Bithynia tentaculata (L.)	*	*	*
Bithynia leachii (Sheppard)	*	*	*
Lymnaea truncatula (Müller)		d	
Lymnaea palustris (Müller)		d	
Lymnaea stagnalis (L.)			*
Lymnaea auricularia (L.)		*	*

	Bridgman 1872	*Mayfield 1909*	*Present Survey 1978*
Lymnaea peregra (Müller)		*	*
Myxas glutinosa (Müller)	*	*	
Planorbis carinatus Müller		*	*
Anisus leucostoma (Millet)	*	d	
Anisus vortex (L.)		*	*
Bathyomphalus contortus (L.)			*
Gyraulus albus (Müller)	*	*	*
Gyraulus laevis Alder	*	*	
Segmentina nitida (Müller)	*	*	
Menetus dilatatus (Gould)	*		
Ancylus fluviatilis Müller	*	*	*
Acroloxus lacustris (L.)	*	*	*
Unio pictorum (L.)		*	
Anodonta cygnea (L.)		*	*
Anodonta anatina (L.)			*
Sphaerium corneum (L.)			*
Sphaerium lacustre (Müller)	*		
Pisidium amnicum (Müller)			*
Pisidium milium Held.	*		
Pisidium subtruncatum Malm.		*	

The character of the river changes after the weirs at New Mills. The river is open to powered boats, although few venture up as far as the weir. The banks are replaced in many parts by high factory walls, but pollution seems to be minimal. The river through the city remains biologically rich. The shallower edges of the river often show a bed of brick and stone rubble which provides a greater diversity of habitat from the naturally accumulated silts and muds. The major macrophytes dominating the river include *Sparganium emersum, Sagittaria sagittifolia, Potamogeton perfoliatus* and *Nuphar lutea.* The perfoliate pondweed declines in abundance towards the Cow Tower and becomes scarce further downriver. The unbranched bur-reed increases its cover but below Bishop's Bridge its growth is less vigorous and below Carrow Bridge only occasional stands flourish. The complete list of plants between New Mills and Bishop's Bridge is given below.

Sparganium emersum	d	*Oenanthe fluviatilis*	r
Sagittaria sagittifolia	o/f	*Ranunculus fluitans*	r
Potamogeton perfoliatus	o/f	*Elodea canadensis*	r
Nuphar lutea	l/f	*Callitriche sp.*	r
Myriophyllum spicatum	o	*Lemna minor*	l/o
Ceratophyllum demersum	r/o	*Azolla filiculoides*	r
Potamogeton pectinatus	r	*Fontinalis antipyretica*	o
		Cladophora sp.	a

Sparganium emersum is an extremely shade tolerant species and its importance in the river through the city may be related to the high walled building enclosing the Wensum preventing direct sunshine from falling onto the surface. The river below Bishop's Bridge is greatly influenced by the congestion and movements of pleasure craft and further downstream by commercial

vessels. The waters are deeper but macrophytes survive, mainly *Sparganium emersum*, but in a poorly developed form.

The river sponge *(Ephydatia fluviatilis* (L.)) is abundant immediately below New Mills. Mr Percy Trett (pers. comm.) reports that the sponge below the weir is white and lacking in symbiotic algae, but further downriver the algae give it a bright green colouration. The sponge is richly parasitized by larvae of the Spongilla fly *Sisyra* sp. Identification of the larvae of this lacewing is extremely difficult but Mr E. T. Daniels has taken adult specimens of *Sisyra fuscata* (Fabr.) from the Wensum at New Mills. In this section of the river there is a huge increase in the density of the ear pond snail *(Lymnaea auriculara)* which reaches high numbers in the lily beds near Coslany and Duke St. bridges. On the 22nd November 1978 the Yarmouth Sub-Aqua Club made one of their periodic dives into the Wensum at Fye Bridge and came across over fifty crayfish living in beer mugs from the nearby public house. Mr Trett (pers. comm.) noted that crayfish are rarely found in this area of the Wensum.

Finally at Trowse Eye the Wensum joins the Yare.

River Tud. The Tud is one of those delightful streams that is full of interest for the naturalist. The head waters flow over chalky flints but for most of its length the river flows over silty beds with stretches of gravels. *Veronica beccabunga* L., *Ranunculus fluitans*, *Myriophyllum spicatum*, *Apium nodiflorum*, *Zannichellia palustris*, *Potamogeton perfoliatus* and *Myosotis scorpioides* L. form the major plant cover. At Costessey small stands of *Groenlandia densa* (L.) Fourr. occur. This plant has an uneven distribution in the Wensum valley and the tributaries of the main river. It was found at Shereford Common in the Wensum in 1977, in the main drain flowing across Ringland Common and in the Tud at Costessey in 1978.

The Tud is important as a refuge for the rare bug *Aphelocheirus aestivalis* Westwood, which was first recorded from the Wensum at Costessey by the Rev. J. Landy Brown in 1878. E. A. Ellis recorded it from below Hellesdon in the early 1970's but failed to find it in 1977 when he noted that the river bed had become too muddy and the water too cloudy. This bug is unique to this region of the Wensum valley in East Anglia and is known only from a few other rivers in England where the waters are clear and flow over stony or gravelly beds. Other water bugs taken on the present survey include *Siagara dorsalis* (Leach), *Sigara falleni* (Fieb.), *Gerris lacustris* and *Velia caprai* (Tamanini). Water beetles were represented by *Ilybius fuliginosus* (Fab.), *Haliplus fluviatilis*, *Limnius volckmari* (Panzer), *Oulimnius tuberculatus* Müller), *Potamonectes depressus* (Fab.) and *Brychius elevatus* (Panzer), the latter species being recorded by Thouless in running waters at Costessey in 1893. The very common mayfly larvae of *Baetis rhodani* (Pictet) are widely distributed in the Tud, whilst in the stony bed of the river at Costessey *Heptagenia sulphurea* (Müller) was recorded.

Alderford Beck. The small stream flowing from the lake at Haveringland Hall and passing through Felthorpe and Swannington before joining the Wensum at Alderford Common was named in the 1806 map of Faden as

Alderford Beck. The shallow waters are dominated by watercress, starworts, water forget-me-not, brooklime, and water celery. One interesting discovery in the beck was young instars of *Beraedes minutus* (L), a caddis nymph new to Norfolk. Adult caddis flies of *Athripsodes cinereus* (Curtis) were taken in flight on the 28th September 1978 over the beck. Daniels (1960) noted this caddis fly as being abundant on the Wensum mainly in July, and Claude Morley (unpublished records) found it to be 'always common at Brandon in June-August, 1906-29'.

Blackwater River. The Wensum is unfortunate in having two rivers flowing into it with the same name. To separate the two rivers we have adopted the name 'River Blackwater' for the stream joining the river at Whitewater near Billingford, and the name 'Blackwater River' for the stream entering the Wensum at Lenwade. The latter stream is formed from three smaller streams arising in Bawdswell, Reepham and Heydon which join together at Whitwell Common. The streams are all shallow, moderate flowing with beds of silt and small gravel patches. At Eades Mill there is a millpool and weir. This tributary was surveyed in winter when emergent and aquatic vegetation had died back. However, casual observations made in summer suggest that the waters are poor in such plants. Large numbers of gammarids were taken at three sampling points. *Asellus aquaticus* and *A.meridianus* were common in the river.

Vegetational Patterns Of The River

The catchment area of the Wensum is largely formed from boulder clay over chalk and this is reflected in the aquatic vegetation, with species such as *Myriophyllum spicatum*, *Potamogeton perfoliatus*, *Oenanthe fluviatilis*, *Potamogeton pectinatus* and *Zannichellia palustris* forming communities. These plants are considered by Haslam (1978) to be characteristic of mixed chalk-clay catchments. Other factors influencing the river vegetation include water clarity, low pollution levels, the presence of weirs, the relatively constant flow of the water and regular weed cutting as an integral part of management. The immediate surrounds of the river are largely pasture, gravel pits, and to a lesser extent arable land. There are many difficulties in dividing a river and its vegetation into well defined sections, but never-the-less a number of broad zones can be recognized in the Wensum. However, stretches of the river may not always fall within this overall pattern.

1. Near the source the river is very shallow and ditch-like in appearance. Emergent plants dominate the stream, especially watercress, starworts, pink water speedwell and water celery. Dense closed communities form in the running waters, although regular clearing of the stream with mechanical dredgers produces more open communities temporarily.

2. The upper reaches from Norman's Burrow Wood to Shereford are generally fast flowing over gravel and chalk beds. On the stones *Pellia endiviifolia* Dicks. and *Fontinalis antipyretica* occur, whilst on the chalk starworts, spiked water-milfoil, pink water speedwell and horned pondweed are common. Near Raynham there is a siltier and slow flowing stretch.

Zannichellia palustris is a semi-eutrophic species which is often found in shallow silts with rather small water volumes. It is common on chalk-clay streams (Haslam, 1978).

3. Between Shereford and Elmham the river deepens to 1m and the flow slackens. There are a number of mills along the river which produce a sequence of fast flow below the mill weir, a slow flowing central reach and a deeper section near the next mill. The main aquatic macrophytes include *Elodea canadensis, Sparganium emersum, Potamogeton pectinatus, Potamogeton perfoliatus, Potamogeton crispus* and *Veronica catenata.*

4. The river between Elmham and Attlebridge increases in depth to over 1m and occasionally to 2m. There is a moderate flow of water with a number of mills and weirs. The vegetation is dominated by *Potamogeton perfoliatus* with *Elodea canadensis, Myriophyllum spicatum, Ranunculus fluitans, Sagittaria sagittifolia* and *Nuphar lutea* in the slower reaches. *Potamogeton perfoliatus* is usually associated with semi-eutrophic streams with a medium to large water volume. It prefers a firm substrate with sediment above (Haslam 1978). These conditions are frequently present in the Wensum. *Oenanthe fluviatilis* first appears in this zone. It is a species of chalky-clay rivers where it prefers fairly large volumes of water Haslam, 1978).

5. Between Attlebridge and Norwich the river deepens gradually. *Potamogeton perfoliatus* is still the dominant species, although there is an increase in the cover of *Sagittaria sagittifolia, Oenanthe fluviatilis, Elodea canadensis, Myriophyllum spicatum* and on the surface *Azolla filiculoides.* Yellow water lilies are often dominant in the deeper water communities.

6. Below New Mills *Potamogeton perfoliatus* becomes rare and *Sagittaria sagittifolia* and *Sparganium emersum* are the dominant aquatics. *Oenanthe fluviatilis, Elodea canadensis, Nuphar lutea, Myriophyllum spicatum, Potamogeton pectinatus* and *Ranunculus fluitans* occur in this zone. The vegetation changes reflect changes in the river, e.g. tidal action, turbulence from boats, increasing depths and some pollution.

Within the river system there are obvious differences in distribution of plants at any one site but these differences in spatial patterns were not investigated in the survey.

Sites of Natural History Interest

LYNG EASTHAUGH MEADOWS. A series of meadows which have so far escaped improvement and which retain a flora which may once have been widespread in the river valley. The flora can best be described as ranging from a base rich marsh in the wetter areas through to alluvial meadow in drier parts. Grasses and sedges recorded include *Poa pratensis, P.trivialis, Festuca rubra, F. pratensis, Lolium perenne, Dactylus glomerata, Cynosurus cristata, Carex disticha, C. nigra, C.hirta, C.panicea, C.paniculata, C.riparia* and *C.acutiformis.* Other species of interest noted in the survey include *Dactylorhiza praetermissa, D.incarnata, D.traunsteineri, Anagallis tenella, Rhinanthus minor, Linum catharticum* and *Triglochin palustris.* There is a heronry in a nearby riverside wood.

Whitwell Common. A fen with some reed beds and alder carr. In the past it was cattle grazed but it is now becoming overgrown in places. This is a fully documented site.

Swannington Upgate Common. Mostly dry heathland with some fen and wet heath communities (S.S.S.I.).

Alderford Common. Another S.S.S.I. on the Alderford Beck with a chalk flora developed on a chalk erratic.

Gravel Pits. Two main areas of gravel workings are sited along the river valley. The pits at Lenwade are managed by the Norfolk Naturalists' Trust. Other pits are used by angling clubs.

Summary

The Wensum and its tributaries have been managed by man for many centuries. In the past the channel of the river may have been anywhere in the alluvial plain but the presence of mills and weirs with their associated dykes and drains clearly indicates that man has, and continues to, direct the form and pattern of the river valley. The present position is largely fixed by channel maintenance but as drainage patterns change to meet new agricultural needs so this lowland river system will be further modified. Today much of the low lying land in the Wensum valley is managed by traditional agricultural methods involving summer grazing and hay mowing, but as more efficient land drainage patterns are developed so an increasing change to arable farming can be anticipated. Regular ploughing affects soil texture and consequently the amount of silt entering the waters; this in turn influences the turbidity of the waterways and also the type of substrate. Arable farming is closely linked with an increase in the use of fertilizers and this can lead to water enrichment and thus to changes in the aquatic communities of the rivers, dykes and drains. The present grazing methods produce natural manure which appear to be minimal in their effects on the system. Above Norwich the city waterworks remains an important factor in the maintenance of unpolluted waters with their rich biological communities.

The Wensum and its associated rivers, dykes and drains remains of great interest to naturalists. In the head streams the vegetation can be abundant in the shallow waters, although shading by mixed woodlands can reduce the coverage of the aquatic macrophytes. Near the mills and weirs the river slows to produce characteristic deep water plant communities, but these are replaced below the barriers by species tolerant of swirling and turbulent waters. The dykes and drains are important in offering different conditions where other diverse plant and animal communities can develop. The Wensum is of great interest since many of the valley gravels in the river terraces have been excavated to make large lakes which form important habitats for bird life.

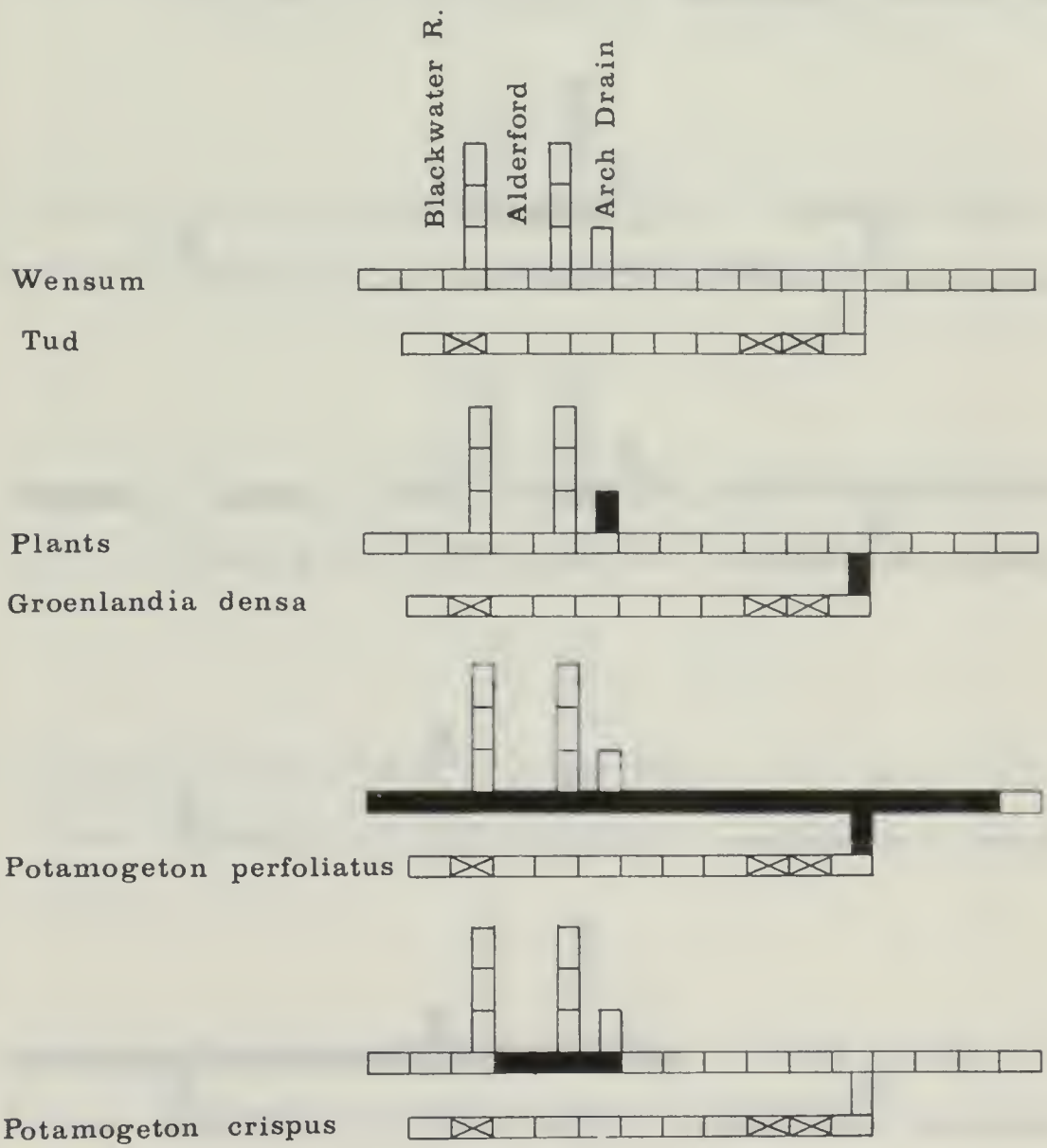
The whole of this lowland valley forms a major refuge for wildlife and it is to be hoped that this beautiful central Norfolk river will continue to offer naturalists opportunities for study and enjoyment in the centuries to come.

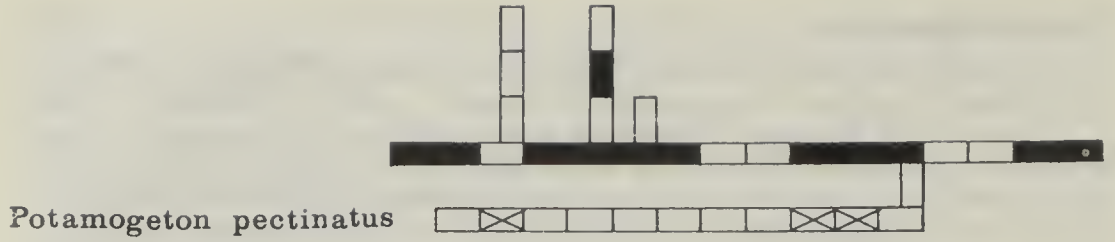
Acknowledgements

We would like to thank the many landowners and farmers who kindly allowed us access to the river valley. We are indebted to Messrs E. A. Ellis, G. N. Foster, P. Trett, E. T. Daniels, I. D. Wallace, P. Hart and A. Bull for help in identification and information about the natural history of the Wensum valley. We would like to thank Dr J. Wortley and Mr F. Smith of the Anglian Water Authority for information concerning the fish farm at Hellesdon and the algae collected in the Norwich Waterworks.

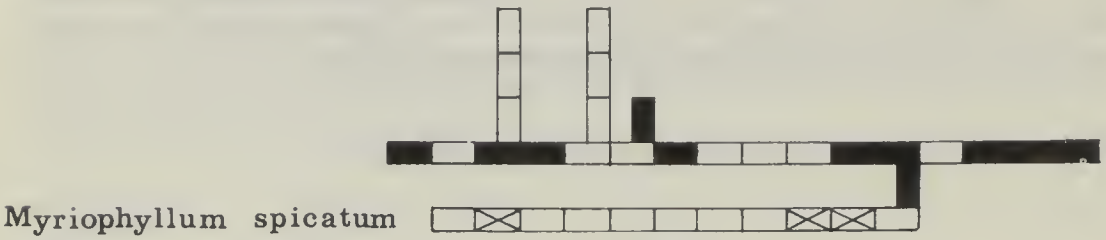
FIG. 2 Examples of the distribution patterns of selected species throughout the lower Wensum valley river system surveyed in 1978-79. The diagrams are based on presence or absence data for 2 km stretches of the river downstream from Lyng.

Key: black present, white absent, crossed not sampled.

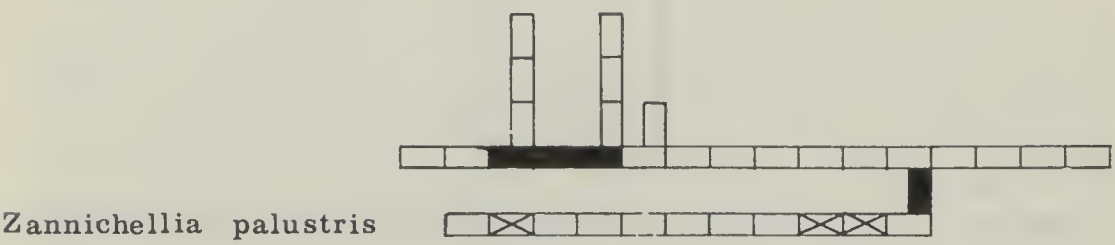




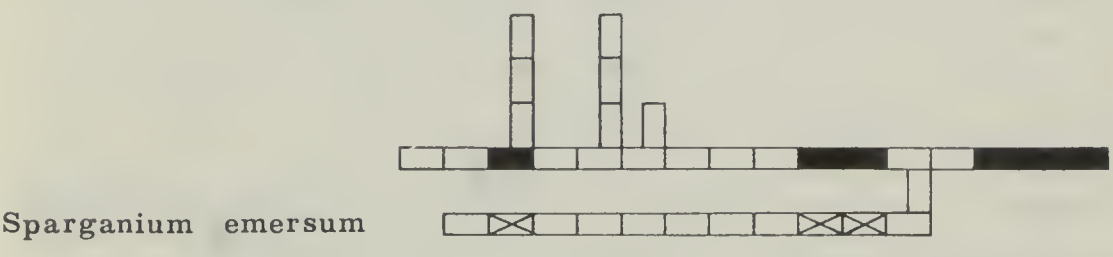
Potamogeton pectinatus



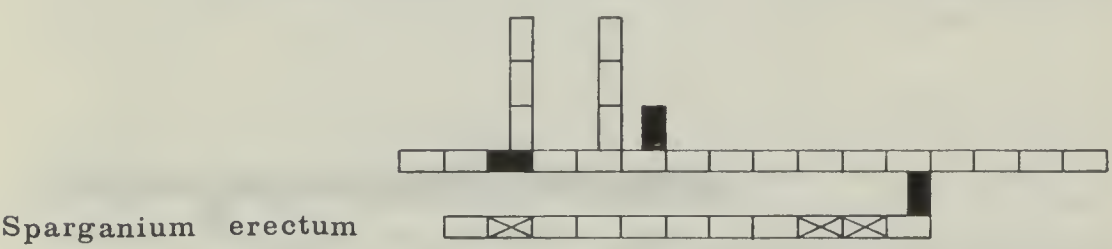
Myriophyllum spicatum



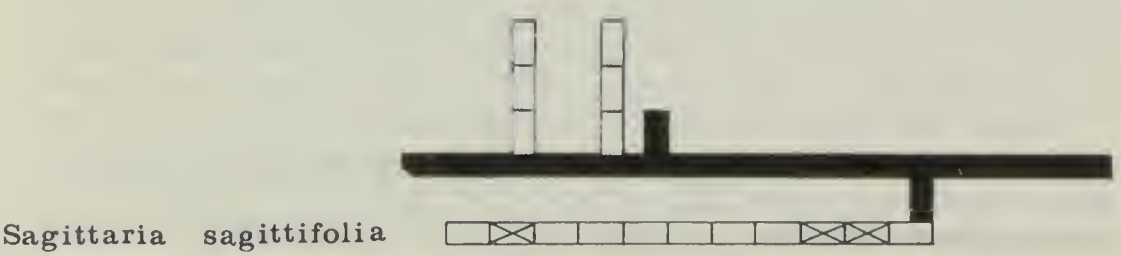
Zannichellia palustris



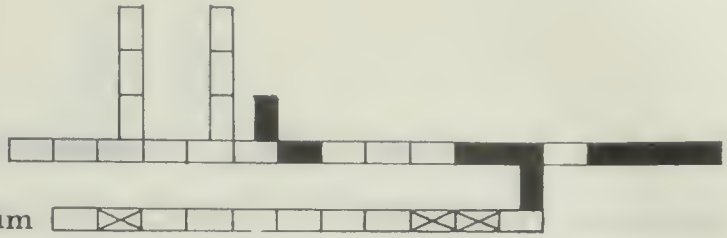
Sparganium emersum



Sparganium erectum



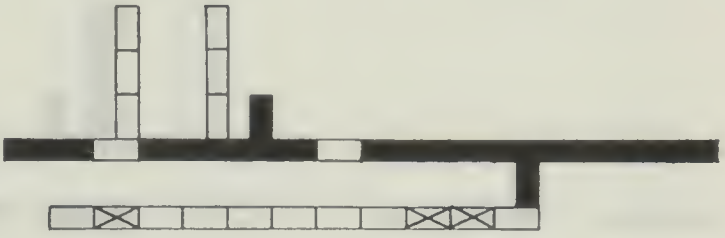
Sagittaria sagittifolia



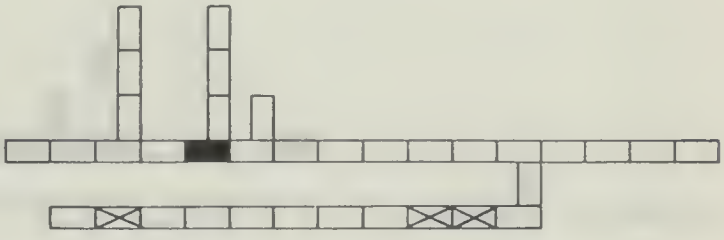
Ceratophyllum demersum

Elodea canadensis

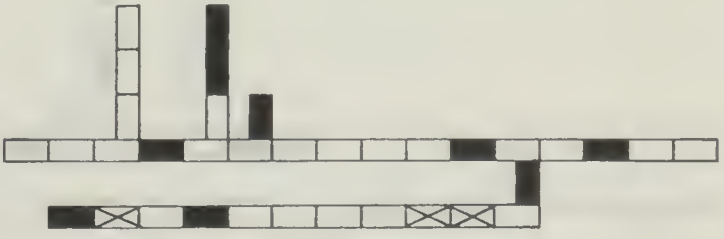
Callitriche sp.



Nuphar lutea



Veronica catenata

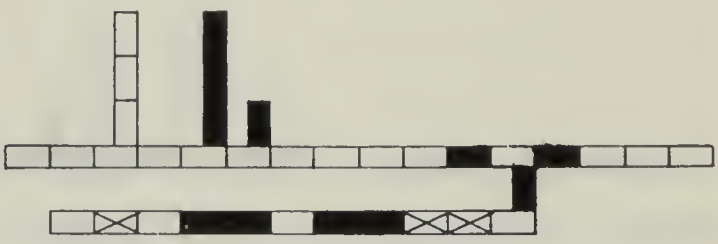


Veronica beccabunga

Oenanthe fluviatilis

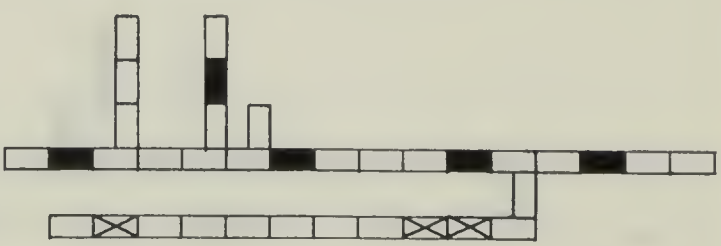
Rorippa nasturtium-aquaticum

Myosotis scorpioides

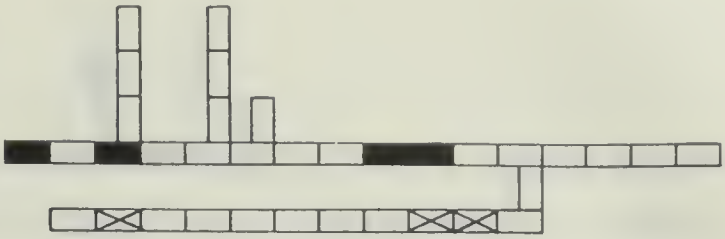


Apium nodiflorum

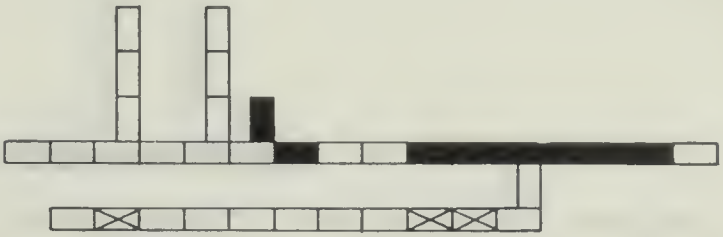
Glyceria maxima



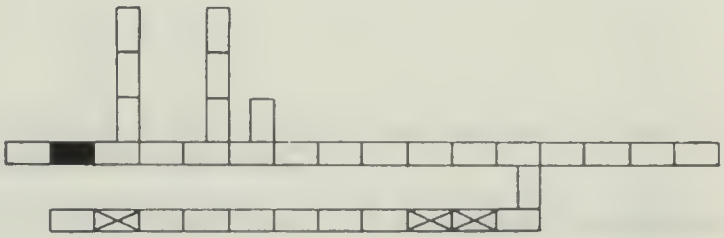
Phragmites communis



Phalaris arundinacea

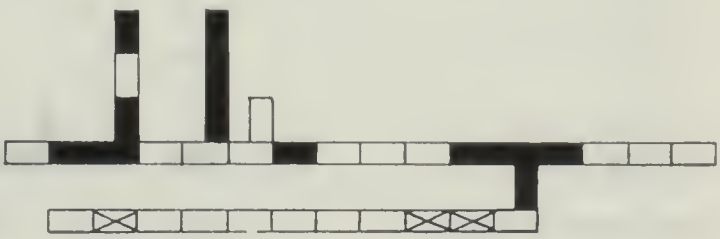


Azolla filiculoides

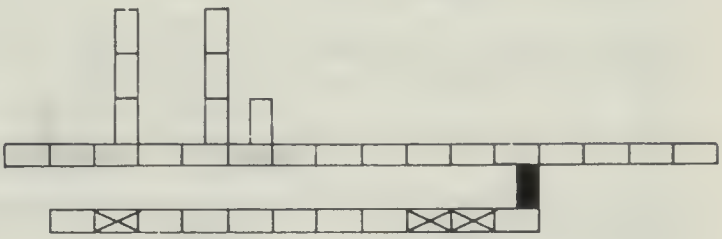


Mayflies

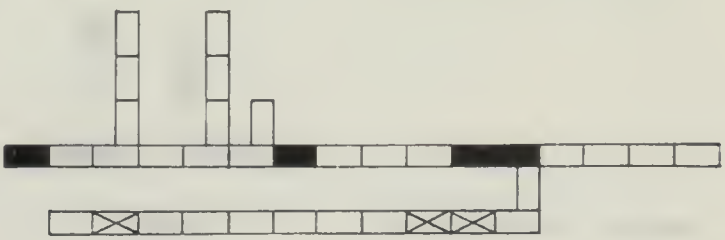
Cloeon dipterum



Baetis rhodani



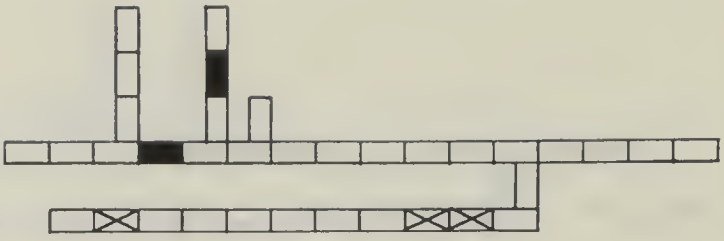
Ephemera danica

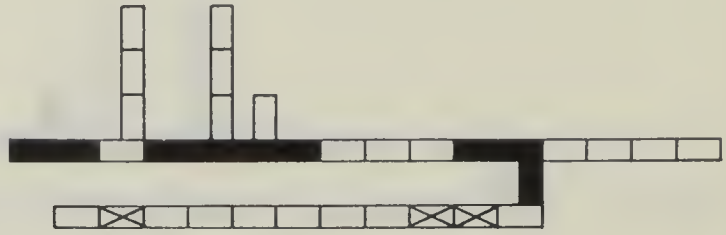


Ephemerella ignita

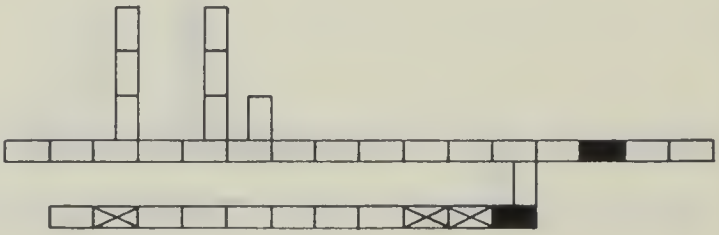
Water Beetles

Haliplus lineatocollis





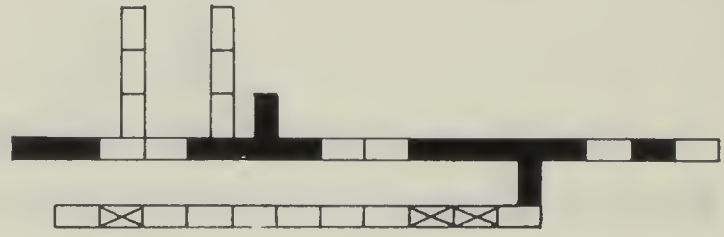
Haliplus fluviatilis



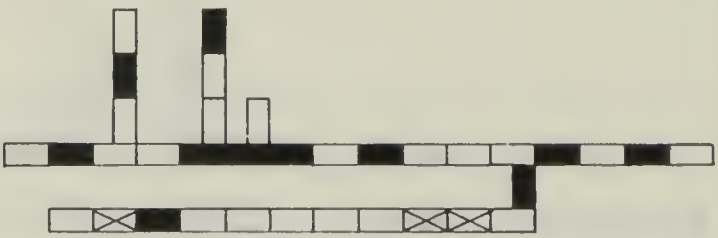
Brychius elevatus

Crustaceans

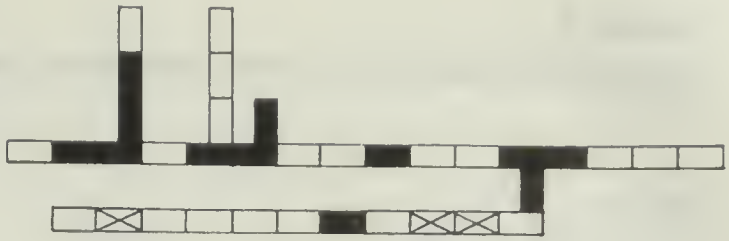
Austropotamobius pallipes



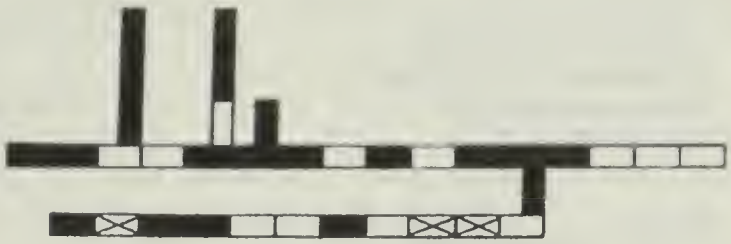
Crangonyx gracilis



Asellus meridianus



Asellus aquaticus



Gammarus pulex

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Appendix 2

List of plants recorded during 1978-79 in River Wensum Survey additional to Appendix 1 (1978)

SPECIES	*Habitat*		
Angiospermae	A	E	B
Apium graveolens L.			*
Arrhenatherum elatius (L.) Presl.			*
Glechoma hederacea L.			*
Hydrocharis morsus-ranae L.		*	
Lycopus europaeus L.		*	
Lythrum salicaria L.		*	*
Musci			
Leskea polycarpa Hedw.			*
Pteridophyta			
Azolla filiculoides Lam.	*		
Algae			
Scenedesmus sp.	*		
Coelastrum sp.	*		
Chlamydomonas sp.	*		
Oedogonium sp.	*		
Zygnema sp.	*		
Chlorella sp.	*		
Volvox sp.	*		
Microspora sp.	*		
Closterium sp.	*		
Pediastrum sp.	*		
Eudorina sp.	*		
Cosmarium sp.	*		
Cyclotella sp.	*		
Diatoma sp.	*		
Nitzschia sp.	*		
Stephanodiscus sp.	*		
Synedra sp.	*		
Pinnularia sp.	*		
Tabellaria sp.	*		
Fragillaria sp.	*		
Cymbella sp.	*		
Aphanizomenon sp.	*		

A submerged and floating flora
E emergent and marginal flora
B bank flora

Appendix 2a

List of animals recorded during 1978-79 in River Wensum Survey additional to Appendix 1a (1978).

Phylum *Protozoa*
- Kerona pedicularis

Phylum *Platyhelminthes*, Class *Turbellaria*
- Bdellocephala punctata (Pallas)
- Dugesia tigrina Girard

Phylum *Mollusca*, Class *Gastropoda*
- Theodoxus fluviatilis (L.)
- Lymnaea auricularia (L.)
- Planobarius corneus
- Ancylus lacustris

Class *Lamellibranchia*
- Anodonta anatina (L.)
- Pisidium amnicum (Muller)

Phylum *Annelida*, Class *Hirudinea*
- Hemiclepsis marginata (Muller)

Phylum *Arthropoda*, Class *Insecta*
- Coenagrion puella (L.)
- Agrion splendens (Harris)
- Limnephilus flavicornis (Fab.)
- Hydropsyche angustipennis (Curtis)
- Athripsodes cinereus (Curtis)
- Athripsodes aterrimus (Stephens)
- Beraedes minutus (L.)
- Heptagenia sulphurea (Muller)
- Halesus radiatus (Curtis)
- Anabolia nervosa (Curtis)
- Sisyra fuscata (Fabr.)
- Aphelocheirus aestivalis Westwood
- Velia caprai (Tamanini)
- Platambus maculatus (L.)
- Agabus sturmii Gyllenhal
- Simulium sp.

A FURTHER NOTE ON CATCH-TENTACLES IN SEA ANEMONES

by R. B. Williams
2, Carrington Place, Tring, Herts.

Catch-tentacles are organs, homologous with ordinary tentacles, which occur only in some species of acontiarian sea anemones. They are found usually within the primary (inner) tentacle cycle and sometimes additionally in the secondary and tertiary cycles but not on every individual of a species which can possess them. They can usually be recognized by their blunt appearance when contracted, peculiar "searching" movements during which they extend to many times the length of ordinary tentacles, and microscopically by their special nematocysts (Williams, 1975). Although catch-tentacles were discovered well over a century ago, it was not known until recently that they are organs of aggression used inter- or intraspecifically against other anemones (Williams, 1975). Catch-tentacles can transmutate from ordinary tentacles and back again and, at least in some cases, their development can be induced by tactile stimulation by asexually produced individuals from different clones of the same species (Purcell, 1977). There is still much about catch-tentacles that is unknown or poorly understood and it is therefore important that new records and information on their behaviour be documented as fully as possible. Recently, some interesting observations have been made on catch-tentacles and their behaviour in some Norfolk sea anemones.

In December, 1974, I discovered nine catch-tentacles on a specimen of *Metridium senile* (L.) from deep water off Cley-next-the-Sea, Norfolk, the first North Sea record of catch-tentacles in this species (Hamond & Williams, 1977). *M. senile* from the western English Channel have also been found with catch-tentacles (Williams, 1975). It would seem therefore that the division of *M. senile* into a Pacific subspecies *fimbriatum* with catch-tentacles and an Atlantic subspecies *senile* without catch-tentacles (Hand, 1956) is not valid.

On 1 November 1975, I found, at Wells-next-the-Sea, Norfolk a small rock on which was a natural assemblage of anemones consisting of *Metridium senile* (L.), *Sagartia troglodytes* (Price) and *Diadumene lineata* (Verrill) (the latter species previously recorded as *Haliplanella luciae* (Verrill) by Williams, 1975 and Hamond & Williams, 1977). One specimen of *Diadumene* possessed three catch-tentacles (2 in the inner cycle alternating with 1 in the second cycle), and since such specimens seem to be rare in England (Williams, 1975) and information on the effect of *Diadumene lineata* catch-tentacles on other anemones is lacking[1], the rock was kept in a laboratory tank in order to observe any interactions. For 78 days, the positions of all the anemones

[1]Since the original manuscript of this paper was written, I have learned that Ms Fukui and Dr Yanagita now have new information being prepared for publication to supplement their first observations on *Diadumene lineata* which they so kindly allowed me to cite in Williams (1975).

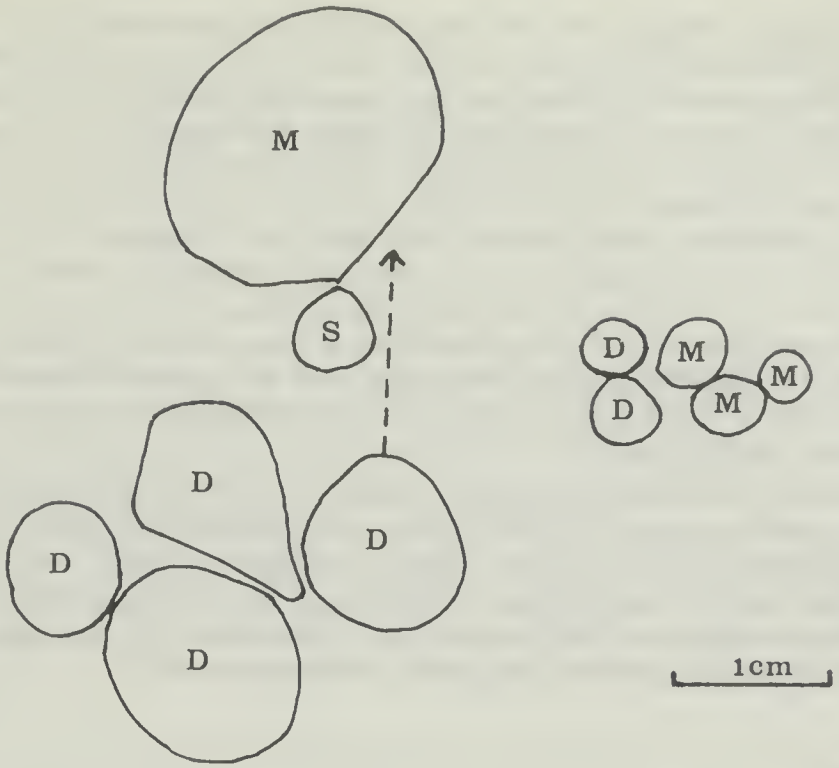

FIG. 1. Plan of natural assemblage of anemones from Wells Harbour.
D = *Diadumene*, M = *Metridium*, S = *Sagartia*.
The arrow indicates the interactions between the *Diadumene* with catch-tentacles and the *Metridium*.

remained unchanged (see Fig. 1) and no aggressive behaviour was seen. On 18 January 1976, one of the extended inner catch-tentacles of the *Diadumene* was seen to touch the tentacles of a nearby *Metridium*. After about 2 seconds, the tentacles of the *Metridium* grasped the catch-tentacle as if it were prey. After a further 10 seconds, the *Metridium* contracted sharply, taking in the tip of the catch-tentacle, but leaving the tips of its own tentacles just visible. The *Diadumene* catch-tentacle slowly contracted and the tip broke off after about one minute, during which time the *Metridium* tentacle tips writhed vigorously. Following this, the remaining two catch-tentacles, previously retracted, became active and, about 15 minutes later, the other inner catch-tentacle touched the tentacles of the same *Metridium* which had by then expanded again. The same sequence of events occurred as before, except that it took about 6 minutes for the catch-tentacle to sever following the contraction of the *Metridium*. Both catch-tentacles had touched the column or tentacles of other *Diadumene* with no effect. During the next 2 months, no obvious necrosis of the *Metridium* was seen, nor did any of the anemones change their positions.

These observations raise some interesting points. The *D. lineata* touched by the catch tentacles with no effect were probably clone-mates, since the population from which they came seems to consist only of males and repro-

duces asexually (Hamond & Williams, 1977). Catch-tentacles of different species of anemone might vary in the potency of their nematocysts, since the *Metridium* attacked in this case was apparently unaffected, yet anemones may be badly injured or even killed by the catch-tentacles of *Cereus pedunculatus* (Pennant), *S. troglodytes* (Price), *S. elegans* (Dalyell) or *D. cincta* Stephenson (Williams, 1975). All three species of anemone in the natural assemblage observed might possess catch-tentacles (Williams, 1975), yet only one individual of one of the species manifested them. Despite the results of Purcell (1977), the foregoing observations prompt the conclusion that the close proximity, if not the actual touching, of three different species (Fig. 1), all capable of possessing catch-tentacles, had no consistent effect on the development of these organs, otherwise all individuals might have been expected to possess them.

Similarly, inconsistent aggressive behaviour has recently been observed (Williams, 1978) amongst actiniid anemones which bear organs of aggression, analogous with catch-tentacles, called acrorhagi. It might be that some comparative work on aggression of sea anemones would pay dividends but clearly much requires to be done before the development and functions of both catch-tentacles and acrorhagi are fully understood.

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1979 WEATHER SUMMARY
by T. B. NORGATE

Norfolk Rainfall Organisation

January. The year began with frost, snow and bitter blizzards, for the first half of the month and a little more at the very end. During this century only 1963 and 1940 were colder in January. This year there were only four nights devoid of ground frosts and five without air frosts. The coldest night was the 28th with a ground minimum of -17½°C or almost 0°F.

An increase of sunshine over the average was the only redeeming feature. South Norfolk had the highest precipitation, including much snow. Drifting in squally showers off the North Sea made it difficult to define a pattern of distribution; but undrifted readings of 125mm (5") occurred inland with more near the coast.

February. This month was nearly as cold as January and 3°C (5°F) below normal but lacked sunshine by 25%. There were only two frost free nights (on the ground) but they were not so severe as in January. Precipitation, i.e. snow plus rain, was slightly above average. Remains of last month's snow hung about until mid-February when a further 50 - 75 mm (2-3") fell with serious drifting blocking most roads.

March. This was the third successive cold month with ground frosts more often than not, but none were severe. For all that, March has not been colder since 1947 though two or three other years have equalled 1979. Rainfall was excessive, especially in the west of the county and again had not been exceeded in March since 1947. As might be expected sunshine was low, about 85% of average but not so dull as in March 1975.

April. So far as the mean temperature was concerned, the month was fractionally warmer than usual — and for the first time this year. A false impression of warmth was created since Easter was the warmest one for 30 years with a maximum temperature up to 21°C, i.e. over 71°F.

Despite the absence of heavy rainfalls, the month was on the wet side especially on the higher ground in the north of the county. Sunshine was slightly above normal with only three days when it failed altogether. However there were four days each with over 10 hours to make some amends.

May. A sprinkling of thunderstorms on at least five days produced more rain than usual, especially in the N.W. and S.W. of the county. Four places recorded over 100mm (4") for the month, whereas Ingham on the east side had less than half as much.

Despite increased sunshine, with only one completely dull day, the mean temperature was slightly lower than normal with the same frequency for both air and ground frosts as in April, three and eight respectively.

June. Again scattered thunderstorms boosted rainfall to normal, interspersed with several days of fine weather. Aylsham was the wettest place with 73mm (nearly 3''), whereas Holme-next-the-Sea recorded only a third as much.

The mean temperature was exactly normal, only two days failing to record maxima below 15°C (60°F). Sunshine was almost exactly normal with six days recording double figures.

July. Drought conditions prevailed until thundery weather on the 29th. Only in the west and north of the county did rainfall exceed 25mm (1'') which is 50% of the average. Elsewhere had to be content with only 20% and some places only having measurable rain on three days.

The mean temperature was almost up to normal. There were six days with maxima in excess of 24°C (75°F). Thunderstorms broke out after the hottest day with 28°C (nearly 83°F).

Sunshine hours were a little on the high side. Though there were only six days with double figures, (as in June) there was some to register every day.

August. Rainfall was very variable in the county, thanks to four or five thunderstorms. The maximum amount fell at Docking, nearly 96mm (over 3¾''), whereas some places had under 40mm (about 1½''). The last week was quite dry.

There were only five days with maxima above 24°C (75°F) but often these were followed by cold clear nights especially at the end of the month. There were four occasions when minima dropped to 3.0°C (37½°F) or below. Sunshine hours were almost up to normal.

September. This was a much more pleasant month with more sunshine than in either July or August and 30% in excess of the average for September. Despite this the mean temperature was nearly ½°C below the usual. Four slight ground frosts were recorded, a reminder that autumn had started.

Rainfall was down 37% in central Norfolk, and it was drier still in the S.E. There were 13 consecutive dry days, just short of an official drought.

October. The month began with quite warm weather, the temperature twice exceeding 20°C (60°F). Expectedly it was much colder at the end with five ground frosts and only one air frost, but only just.

The mean temperature was slightly in excess of normal, and April was the only other month with a similar claim (by less than ½°C).

Sunshine was nearly 25% above usual and evenly spread throughout the month. Rainfall was slightly above 50% of the average in most of the county and even less in many scattered places. Nevertheless there were never more than four consecutive dry days.

November. This is normally the wettest month in the year; but though it rained on 22 days amounts were mostly small, especially towards the west of the county, otherwise distribution was erratic.

Temperatures were again on the low side, especially in the middle of the month. Maxima ranged from 4½°C (40°F) to 14½°C (59°F). It was a little

sunnier than usual for November, though there were three consecutive sunless days, the first time since wet March.

December. 1979 ended with by far the wettest month of the year and only once in the last 100 years has December been really wetter, i.e. in 1914, though 1965 was nearly 10% higher.

The mean temperature was nearly 1½°C (2½°F) above normal and there were fewer frosts than usual, none severe. In fact the month was frost-free until the 19th and maxima were into double figures (C°) up to the 9th. Sunshine hours were well up too, being more than 50% in excess and there were never more than three consecutive sunless days, (twice).

The year. With eight months cooler than average, it is not surprising that the mean temperature for the year was on the low side, though only by a little over ¾°C. But the number of air frosts (82) was nearly 80% above normal. Ground frosts were recorded about 12½% more often than usual. However there were 10 days with maxima 25°C (77°F) or above which is better than last year and almost up to normal. This "yardstick" is reckoned as a "Hot Summer Day".

The number of days during which hail fell was only 6 (about half the avarage) whereas snow fell on 35 days in the year. Though some amounts were minimal, this figure is almost double the usual. January was largely responsible, accounting for nearly half the total.

Despite a poor summer, total sunshine hours for the year (1540) were slightly above average, thanks largely to the contribution from September. The remaining three months all exceeded the normal. Apart from Sept. 1964 which had much the same sunshine as this year, not since 1934 has there been an appreciable sunnier one.

The Seasons. If the weather is considered on a seasonal basis (winter being Dec. Jan. Feb.) an anomaly arises since Dec. 1978 has to be included for the winter of 1979. Dec. 1979 must be carried forward for the winter of 1980. Thus the very mild, wet yet sunny Dec. 1979 is not reflected in the winter of 1979.

The mean temperature for the winter of 1979 at 1.1°C compares with an average of 3.7°C and it was the lowest since -1.3°C for the winter of 1963. This latter was itself the lowest for 100 years or more. The remaining three seasons were all marginally cooler than average.

Both winter and spring were wetter than normal, especially, spring which was the wettest one since 1947, and was about 85% on the high side. Summer and Autumn were on the dry side, but overall the year was about 42mm (over 1½") wetter than average and it was the wettest since 1969 in much of Norfolk.

Hours of bright sunshine were slightly down for winter, spring and summer. But autumn (Sept. Oct. and Nov.) was 22% above normal and was the best since 1973. An interesting fact has emerged that the autumn sunshine has alternated between abnormally high and low totals for the last ten years.

1979 Weather

	MEAN TEMPERATURE °C	°C	NO. OF AIR OR GROUND FROSTS		SUNSHINE HOURS	
	1979	*Avg*	*1979*	*Avg.*	*1979*	*Avg.*
Jan.	-1.3	3.6	26/27	10.4/17.6	54.1	41.9
Feb.	.6	3.6	23/26	10.0/18.1	44.8	61.2
March	4.4	5.3	12/16	6.7/16.9	92.8	134.7
April	7.6	7.4	3/8	3.1/11.8	146.6	143.0
May	10.7	11.2	3/8	.5/4.5	196.8	189.6
June	14.0	14.0	—	.1/1.0	196.5	196.0
July	15.3	15.8	—	-/.2	186.2	183.0
Aug.	15.4	15.9	—	0/.1	176.3	179.2
Sept.	13.4	13.7	-/3	.1/.9	192.0	149.1
Oct.	11.3	10.7	1/5	.3/5.8	117.7	94.8
Nov.	5.8	6.6	8/15	5.6/12.1	70.1	67.1
Dec.	5.4	4.0	6/12	9.1/17.3	66.0	43.3
Year	8.5	9.3	82/120	45.8/106.2	1539.9	1482.9

	DAYS WITH HAIL/SNOW		DAYS WITH THUNDER		RAINFALL MM'S	
	1979	*Avg.*	*1979*	*Avg.*	*1979*	*Avg.*
Jan.	26/27	10.5/17.6	—	.1	59.8	53.6
Feb.	23/26	10.0/18.1	—	.3	51.8	46.6
March	12/16	6.7/16.9	—	.5	105.7	42.6
April	3/8	3.1/11.8	1	1.3	51.8	47.5
May	3/8	.5/4.5	5	2.6	64.3	45.2
June	—	.1/1.0	3	2.4	52.6	43.2
July	—	-/.2	1	2.4	15.9	58.2
Aug.	—	-/.1	4	2.4	49.4	54.9
Sept.	-/3	.1/.9	—	1.9	23.7	51.6
Oct.	1/5	.3/5.8	—	.7	34.6	54.5
Nov.	8/15	5.6/12.1	—	.5	61.2	75.8
Dec.	6/12	9.1/17.3	1	.2	117.6	61.8
Year	82/120	45.8/106.2	15	15.3	688.4	635.5

The above Averages for the 15 years 1964-78 incl.

THE GREENFLY 'INVASION' of July, 1979

Multitudes of greenfly appeared in the air over East Anglia during the last week of July, 1979 and similar 'blizzards' of these insects occurred in many other parts of England, from Yorkshire to the south coast. Large concentrations were encountered at the coast, due to the operation of sea breezes, which tend to have a similar effect on the swarms of ladybirds, hover-flies and other insects after they have risen from the countryside with the help of thermals in anticyclonic weather during the summer. The aphids involved on this occasion proved to consist very largely of species associated with cornfields. Following a wet June, prolonged dry weather in July hastened the withering of wheat, oat and barley foliage and as sap flow diminished, the aphid colonies produced a very numerous brood of alate (winged) viviparous females, which took to the air, trusting to drift migration as a means of finding greener pastures. The predominant species taking part in this operation was *Metopolophium dirhodum* (Walker). The following observations on the behaviour of these insects were made in and near the parish of Surlingham, some seven miles east of Norwich. On July 24th the first swarms of aphids appeared in this vicinity and were attracting much attention from swallows, swifts and martins during the day. Towards evening great numbers of the insects descended to alight on the ground and on various low-growing plants. On the following morning my attention was drawn to a thick mass of greenfly covering a damp coconut fibre mat lying in a yard at Coldham Hall, near the river Yare. During the next few nights similar aggregations were seen on fresh cow dung, wet ground in farmyards and in association with bright yellow plastic buckets, yellow painted doors and in one instance a yellow-handled garden rake from the shiny surface of which the insects had slid to form a heap at the bottom (providing a breakfast for two blackbirds on the following morning). Spiders' webs everywhere became overloaded with the aphids and in the evening of July 27th I saw an *Araneus umbraticus* cutting its old aphis-smothered web adrift on the north wall of a greenhouse. At 10.0 p.m. on July 28th this spider was still eating aphids from an upper fragment of this web, but had completed the construction of a new web by 7.0 a.m. on the following day.

Each day while the weather remained fine, many aphids could be seen rising again into the air as soon as the sun's warmth began to take affect, but this activity had ceased by the end of the month. Meanwhile, those which had settled on various grasses were giving birth to numerous young. I found this activity in progress on leaves of *Glyceria maxima* on July 28th. On the following day I discovered that heavy infestation of sweet corn foliage was occurring in my garden, with up to 4,000 young nymphs present on the lower surfaces of the leaves when inspected on July 31st. Other grasses freely colonised included *Avena fatua* on a headland of a nearby cornfield, and *Glyceria maxima* and *Phalaris arundinacea* in marsh habitats. Smaller

numbers of newly born aphids were found on *Arrhenatherum elatius, Dactylis glomerata, Festuca arundinacea, Holcus lanatus, H. mollis* and *Phleum nodosum. Calamagrotis canescens, C. epigejos* and *Phragmites communis* appeared to be wholly free of infestation by *Metopolophium*.

More than a dozen species of the parasitic mould genus *Entomophthora* have been recorded from aphid hosts and it is not unusual for them to spread death through the ranks of these insects very rapidly when conditions are favourable. On July 30th I noticed that some of the adult aphids were becoming pinkish brown in colour through the development of parasitic fungi in their bodies. On the following day I estimated that about 5% of the adults on a series of maize leaves were affected, but the newly born young surrounding them were still a healthy yellowish-green. By August 5th the parents were all dead and brown and some of the nymphs, which had cast their first skins and now measured 1 mm in length, were pinkish brown and bloated with fungal growth. Two days later the populations on leaves examined had been decimated by 25 to 50%. Fatalities had risen to 75% and over by the following day and on August 9th I estimated the loss as 98% in an original population of 4000 young nymphs on one leaf. By mid-August I could find no living specimens of *Metopolophium* on any grasses in and around my garden. The identification of *Entomophthora* spp. is by no means easy, but using the key by G. M. Waterhouse *(Bulletin of the British Mycological Society* 9, : 15) I found that the fungus responsible for the epidemic in this instance approximated most closely to *E. planchoniana* non. Thaxter.

E. A. Ellis

A PLAGUE OF HEATHER BEETLES IN EAST ANGLIA 1978-9

Great numbers of heather beetles, *Lochmaea suturalis* (Thomson) were found inflicting widespread damage on ling *(Calluna vulgaris)* in various parts of East Anglia in the autumn of 1978. Larvae were noticed in August and adults appeared in September and October. Areas affected in Norfolk included heaths at Syderstone, Salthouse, Kelling, Aylmerton, Holt, Hevingham and Norwich (Mousehold) and dune slacks at Winterton; in Suffolk damage was reported at Dunwich, Kenttishall, Cavenham and Lakenheath Warren. The black form of the beetle predominated in many of the populations. At Winterton, Mr. R. Cobbold found many adults dead in early October, but thousands appeared, crawling over sandy paths there in April, 1979, suggesting that many may have over-wintered as pupae. The ling was again decimated by the larvae in many places in July, 1979.

I have failed to trace any previous record of a similar widespread swarming of these insects in East Anglia, although the species has been present in relatively small numbers over a long period. James Edwards reported it as 'abundant' on Mousehold Heath, Norwich, in 1893 and this is the only published reference indicating anything in the nature of a population explosion locally in over a century.

E. A. Ellis

MIDGES POLLINATING HONEYSUCKLE

The flowers of honeysuckle are well adapted to pollination by hawk moths, which visit them at night. They are also visited by a number of other moths, while bumble bees, including short-tongued species such as *Bombus lucorum* come to them by day. In July, 1976, 1977, 1978 and 1979 I found large numbers of small Ceratopogonid midges swarming over the flowers as they were opening towards nightfall in my garden at Surlingham, Norfolk. These insects attacked the pollen newly exposed on the anthers and became coated with the pollen grains in doing so. They also crawled over the stigmas and left pollen on them, thereby demonstrating their effectiveness as pollinators. Both male and female midges were present at these regular feasts. Samples of the insects concerned were kindly identified by Dr. A. Irwin of the Castle Museum, Norwich, as *Atrichopogon pavidus* (Winnertz).

E. A. Ellis

A THREAT TO BRITISH POPLAR TREES
HYPOXYLON MAMMATUM (WAHL.) MILL.

The fungus *Hypoxylon mammatum* (Wahl.) Mill. was found on *Populus* and *Salix* branches near Wheatfen Broad, Surlingham, Norfolk in 1978, having not been recorded previously from Britain. Further specimens were collected subsequently on *Populus* at Aldeby Wood, on the Norfolk side of the river Waveney below Beccles. The fungus appears in the form of small, round, black papillate swellings on the smaller branches and twigs. This fungus has been reported as a parasite responsible for causing considerable damage and death in the Quaking Aspen *(Populus tremelloides)* and Big Tooth Aspen *(P. grandidentata)* in North America, Hybrids of these species with European Aspen *(P. tremula)* do not appear to show any greater resistance to the disease. Infection of *P. tremula* has been reported from the Soviet Union, where it appears to be as prevalent as on *P. tremelloides* in North America. In France it has beeen referred to as a serious menace to *P. tremula* and to a smaller extent it has been found on *Alnus* and *Salix* species. At Wheatfen the trees affected were mainly Hybrid Black Poplars *(Populus* x *euroamericana).*

R and L. Evans

NOTES TO CONTRIBUTORS

1. All manuscripts submitted for publication should be sent to Dr. E. A. Ellis, Wheatfen Broad, Surlingham, Norwich.

2. Manuscripts should be typed double spaced on one side of the paper. Latin names of genera and species should be underlined. Dates should be in the form 1 January 1972. Text figures should be referred to as Fig. 1, etc.

3. All Latin names should be followed by the authority when the name is first mentioned in the text or table.

4. References should be in alphabetical order at the end of the paper, in the form of:

Bloomfield, E. N., 1905. Fauna and flora of Norfolk. Trans. Norfolk & Nor. Nat. Soc., 8. 117-37.

5. Tables should be set on separate sheets and numbered in arabic numerals.

6. Drawings should be in jet-black indian ink. Shading should be in lines or dots but not in half-tone washes.

7. Page-proofs only will be sent. They should be returned with the least possible delay, and the minimum of essential correction should be made.

8. Authors are supplied with 15 offprints gratis. Additional copies may be ordered when the proofs are returned.

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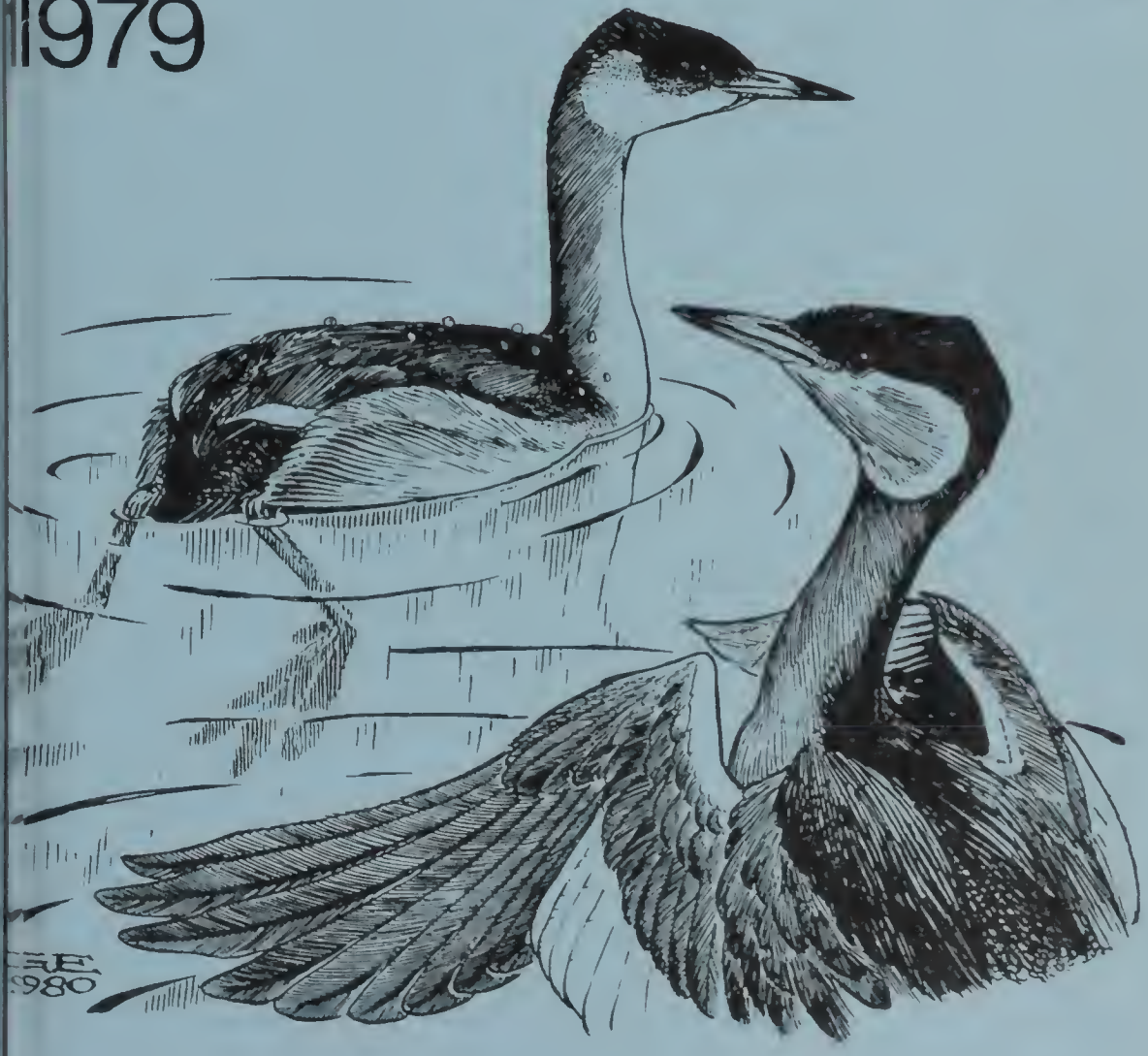
NORFOLK Bird & Mammal Report

1979



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Norfolk Naturalists' Trust Properties

Date Acquired		Acreage		Status*
	On the Coast			
1926	Cley Marshes	435	Gift	S.S.S.I.
1937	Duchess's Pightle, Burnham Overy ...	1	Gift	——
1937	Great and Little Eye, Salthouse ...	10	Purchased	S.S.S.I.
1945	East End of Scolt Island	76	Purchased	N.N.R.
1955	The Eye, Salthouse	21	Purchased	S.S.S.I.
1965	Holme Dunes	400	Purchased, Gift & Agreement	S.S.S.I.
1971	Salthouse Marshes	200	Agreement	S.S.S.I.
	Broadland			
1928 and 1974	Starch Grass (Martham)	43½	Purchased & Gift	S.S.S.I.
1930	Alderfen Broad	72	Purchased	S.S.S.I.
1945 and 1969	Hickling Broad	861	Purchased	N.N.R.
1945	Hickling Broad	500	Leased	N.N.R.
1945	Barton Broad	355	Half Gift &	S.S.S.I.
1952	Barton Broad		Half Purchased	S.S.S.I.
1948	Surlingham Broad	253	Purchased	S.S.S.I.
1949	Ranworth Broad	124	Gift	N.N.R.
1949	Cockshoot Broad	12	Gift	N.N.R.
1964	Firs Marsh, Burgh St. Peter	2½	Leased	——
1971	Martham Broad...	103	Leased	S.S.S.I.
1972	Hardley Flood	90	Leased	——
1972	Chedgrave Common	10	Leased	——
1974	Barton Marshes	10¼	Gift	——
1979	Upton Fen	130	Purchased	S.S.S.I.
	Breckland			
1938	East Wretham Heath	362	Purchased & Gift	S.S.S.I.
1942	Weeting Heath	343	Gift	N.N.R.
1949	Thetford Heath	250	Gift	N.N.R.
	Other Areas			
1957	Thursford Woods	25	Gift	——
1960	Hethel Old Thorn	⅛	Gift	——
1961	Scarning Fen	10½	Gift	S.S.S.I.
1962	Hockham Fen (Cranberry Rough) ...	20	Purchased	S.S.S.I.
1963	Roydon Common	140	Purchased	S.S.S.I.
1966	Stoke Ferry Fen	25	Agreement	S.S.S.I.
1968	Lenwade Water	37	Agreement	——
1968	Dickleburgh Pightle	1	Agreement	——
1972	Smallburgh Fen	19	Leased	S.S.S.I.
1972	Ringstead Downs	26	Agreement	S.S.S.I.

(Continued on inside back cover

Norfolk Bird Report - 1979

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Norfolk Mammal Report - 1979

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NORFOLK BIRD REPORT 1979

Editorial

The Council of the Norfolk Naturalists Trust, in co-operation with the Norfolk & Norwich Naturalists Society, is pleased to present the annual report on the birds of Norfolk.

Review of the Year: Surprisingly, three unseasonal sea-birds appeared on the opening day of the year: Storm Petrel, Arctic Skua and Great Skua — heralding a year full of ornithological interest and contrast. The year will no doubt be remembered by many for the exceptional cold weather in January and especially February. For example temperatures began falling over the Baltic on 13th February and by the next day readings there were between -10° and -25°C whilst gale or storm force ENE winds and blizzard conditions extended from the southern Baltic across the North Sea to East Anglia.

These severe conditions resulted in an unprecedented number of Red-necked Grebes arriving in this country; in Norfolk Black-throated Divers, Slavonian Grebes, Red-breasted Mergansers, Goosanders and Smew and several species of sea-duck also appeared in above-average numbers. Many of these birds frequented inland localities, including some unusual sites such as village ponds and were often relatively tame.

The weather on the Continent also produced high numbers of Bean Geese and Glaucous Gulls and raptors such as Buzzards and Rough-legged Buzzards although the full picture of the latter two species was not totally evident until the departure of wintering birds in April and May. The bird of prey which will be principally remembered in 1979, however, was the Hen Harrier, which continued to build-up in abnormal numbers from December in the previous year. The only rarities turning up as a result of the weather were 3 Great Bustards from Eastern Europe or Russia which disappeared virtually as soon as they had arrived, to the frustration of many local bird-watchers.

The early spring migration, which did not really commence until the last week of March, was unusual in that whilst winter visitors were departing eastward and summer visitors were appearing, birds especially Starlings were still arriving from the Continent. For example, 9000 Starlings flew *west* at Sheringham on 1st April and on the same day at Winterton Starlings were migrating towards all four points of the compass at the same time, although mostly south. Presumably such unusual movements were as a result of displacement caused by the earlier severe weather. This period produced records of White Stork, Crane and an early Red-footed Falcon.

The second half of April was cool and this weather continued into the first week of May. Despite this another Red-footed Falcon and a Tawny Pipit appeared on the East Coast and a Black-headed Bunting (an addition to the county list) on the North coast. Assuming the bunting was a genuine vagrant from south-eastern Europe, and not an escape, the bird certainly looked — and no doubt felt — totally out of place in the cold weather on the coast at that time.

May in Norfolk lived up to its reputation and 1979 was probably one of the best years ever for rarities. Apart from a wide selection of waders on the Cley reserve including Wilson's Phalarope, the area produced Purple Heron, Little Bittern, Little Egret, Crane and Rose-coloured Starling. Nearby an Alpine Swift was at Weybourne and a very tame Red-footed Falcon at Kelling Heath. The East Norfolk coast was not to be outshone with Night Heron and a third Red-footed Falcon at Winterton.

The month of June undoubtedly belonged to Holme which produced a succession of vagrants including Red-rumped Swallow and Scarlet Rosefinch.

In contrast to the first half of the year, the second half was disappointing despite a number of unexpected visitors. In July a Lesser Grey Shrike (possibly a straggler from the spring) was discovered at Ringstead and the bird remained in the area six weeks. In addition, a lucky observer whilst standing in his garden saw a black Stork flying over Breydon.

August produced the second and third additions to the county list: Great White Egret at Hickling followed by Marsh Sandpiper at Cley which kept the warden fully occupied. The second half of the month saw a trickle of passerine migrants and the month concluded with 2 Wilson's Phalaropes at Wisbech Sewage Farm.

As in previous years, westerly winds predominated in September resulting in a now familiar lack of drift migrants until the end of the month. Nevertheless September produced a total of 3 Pectoral Sandpipers, Wilson's Phalarope at Holme and White-rumped Sandpiper at Breydon. The 22nd saw the largest sea bird movement of the autumn: petrels, skuas and shearwaters all being involved. The only rare passerines which appeared were Short-toed Lark and Richard's Pipit near the month-end.

October produced further records of these species, but despite several falls of Thrushes and other migrants the hoped-for far-eastern rarities did not appear. The bird of the month, a well watched warbler at Weybourne, may turn out to be a Blyth's Reed Warbler but a decision as to the correct identification of this difficult species has yet to be made by British Birds Rarities Committee.

November and December were mostly unexceptional apart from 3 wintering Cranes in Broadland and Richard's Pipit at Cley at the year-end.

Acknowledgements: Thanks are due to G.M.S. Easy for the cover drawings of Red-necked Grebes and Hen Harriers and for text illustrations; also to P. R. Allard, B. Bland, J. Buxton, R. J. Chandler and Pamela Harrison for photographs and vignettes; to Holme Bird Observatory/N.O.A. for records; to the Norfolk Naturalists Trust Wardens; to the National Trust (Blakeney Point); to the Nature Conservancy Council (Scolt Head, Holkham, Bure Marshes (Woodbastwick) and Hoveton Great Broad); to Cambridge Bird Club; to Nar Valley Ornithological Society; to P. R. Allard and D. A. Dorling (for compiling the ever increasing annual record cards); to J. T. Fenton, Miss P. Ibbett, P. D. Kirby, Mrs P. Rix and Mrs S. F. Seago for valuable assistance and to all other contributors.

Recording: Records for the 1980 Report should be sent *by the end of January* to Michael J. Seago, 33 Acacia Road, Thorpe St Andrew, Norwich NR7 0PP. Contributors are requested to submit notes in the order followed in Dr K. H. Voous' *List of Recent Holarctic Bird Species* (1977). In order to minimise the work involved, records will not normally be acknowledged. The names of all contributors will be included in the report.

Field descriptions of semi-rarities, as listed in the 1975 and 1978 Reports (copies of such lists may be obtained from the Editor) should also be submitted as such records are considered by the County Records Committee (P. R. Allard, G. E. Dunmore, D. J. Holman, S. C. Joyner and J. Kemp) prior to publication. Any records of rare birds to be considered by British Birds Rarities Committee should be submitted with full details as soon as possible after observation and not left until the end of the year. It will be appreciated that delays in receiving observations create considerable problems for the Recorders, the Records Committee and the printers. For several reasons it is essential that publication is achieved by early September.

SURVEY OF THE YARE BASIN

(P. D. Round, Royal Society for the Protection of Birds)

An ornithological survey of the Yare Basin was carried out in the spring and summer of 1979. The following extracts are taken from the Survey with acknowledgement to the R.S.P.B.:

THE YARE BASIN is one of the few remaining extensive tracts of damp, low-lying grassland (grazing marsh) in Britain. Much of the area lies below 1m with a water table about ½m below the ground surface. Until very recently, the pattern of land-use had probably changed little since the area was originally enclosed by a network of drainage ditches some two hundred years ago.

With increasing land prices and drainage subsidies, there is pressure on the farmer to increase agricultural productivity and the last fifteen to twenty years have seen a gradual increase in the areas of the Yare Basin that have been drained and converted to arable. As a result of the Yare Basin Flood Control Study (1977) it is now proposed to build a barrier near the mouth of the River Yare. This would have the effect of preventing all foreseeable tidal flooding upstream and could be expected to bring about an increase in the rate of 'marsh improvement' and drainage.

Areas of damp and wet pastureland are of high scientific interest for their predominantly wetland animal and plant communities: It is now a matter of national concern that many formerly widespread species have become scarce or restricted in range owing to the reclamation of wetlands (NCC Third Report, 1976-77).

The main objectives of the survey were:

i) to determine the numbers and distribution of selected species of breeding waterbirds on the Yare Basin.
ii) to examine these in relation to land-use and drainage.
iii) to identify those areas of greatest importance for breeding waterbirds.
iv) to assess the possible implications of a barrier scheme upon the ornithological interest of the area.

The Study Area

The Yare Basin occupies about 20,000 ha and is drained by three principal rivers, the Yare, Bure and Waveney which have total catchment area of over 3000 km². The soil is predominantly alluvium with small areas of peat around the margins. Much of the land area lies below 1m O.D. at a lower level than the strongly tidal rivers which are embanked. Drainage takes place through a network of dykes and ditches which, through collector drains, lead to pumping stations. The water table is only about ½m below the surface and some areas are subject to intermittent fluvial or tidal flooding. These factors, combined with a complex pattern of land ownership and poor access have imposed constraints on the type of land use. Most of the area consists of unimproved pasture, used mainly for the summer grazing of beef cattle, young dairy stock and a few sheep. In winter the livestock are kept off the area.

In recent years, several farmers have carried out independent drainage schemes in which the water table has been lowered to about 1½m below the ground surface. Arable farming (largely wheat) has become widespread, and of the 10,225 ha covered during this study, about 1720 ha. were arable.

Between the rivers and their embankment lie narrow strips of marshy ground known as 'ronds'. The most extensive ronds lie along the lower Bure, on the Yare in the vicinity of Chedgrave Marshes and along the River Waveney and occupy about 392 ha. They may be grown up with reeds, which are cut for thatch or open areas with saltmarsh vegetation especially scurvy-grasses and shallow pools.

Methods

Fieldwork was carried out between 5th April and 25th June 1979. All areas were visited once and some 3000 ha along the south side of the lower Bure and along the lower Yare and Waveney was covered on 2 occasions owing to its relatively high ornithological interest.

Breeding Waterbirds

Mute Swan: A total of 49 breeding pairs was recorded. Only 2 nests were found on the rivers. The remainder were all situated on the dykes intersecting the grazing marshes, or in a few cases on permanent pools. They were most concentrated around Chedgrave and Haddiscoe Marshes. In addition 240 non-breeders were found, though this total probably included a few non-breeding territorial pairs as well as some failed breeders. The largest flock was one of 43 birds feeding on young cereal near Acle in April. Although the size of the Norfolk breeding population has remained approximately constant over the last 20 years, there has been a marked change in distribution with more birds nesting on the grazing marshes and many fewer on the Broads and rivers.

Mallard: 433 males were recorded. Although fairly evenly scattered, they tended to be most concentrated around Reedham and on Chedgrave Island where numbers were probably augmented by semi-domesticated stock.

Gadwall: Eleven probable breeding pairs recorded. In most cases males and females were found associating together as single pairs.

Garganey: Three pairs, a single male and a single female were recorded in five different areas. In four of these areas the sightings were made during April and the first week in May and were probably birds on passage. A pair was present on Limpenhoe Marshes 3rd June.

Shoveler: At least 34 males were recorded, over a fifth being concentrated in Burgh Castle Marshes where 7 broods of small young (44 ducklings in total) were also found in late May — the only positive proof of breeding in the study area. Burgh Castle area may have been particularly favoured because of the preponderance of wide ditches, densely fringed with emergent aquatic plants. The Yare Basin is clearly of national importance for this species.

Pochard: Three broods were found on Chedgrave Marshes and a fourth brood at Limpenhoe Marshes. In addition, 7 males were present on a collector drain on Burgh Castle Marshes. Although Pochard have previously been proved to breed on areas adjacent to the Upper Yare (around Surlingham and on Hardley Flood) those found during this survey were the first breeding records for the Breydon area.

Oystercatcher: 68 breeding pairs were recorded. They were mainly centred around Breydon Water and, although present on the Upper Bure, were conspicuously absent from the Yare and Waveney above the New Cut.

Lapwing: 481 breeding pairs were recorded. Numbers were possibly under-estimated in areas not visited before June since young from successful first clutches may have fledged by the end of May.

Snipe: Fifteen drumming birds recorded, usually early in the morning or in the late evening. The occurrence of drumming may have been reduced by generally cold, wet and windy weather throughout April and early May and it is possible a few birds were overlooked. Of the total, 8 were at one very wet locality. They were absent from the main area of the marshes and were confined to the predominantly peaty areas around the upland margins. In April and early May, 354 feeding birds were recorded in the main body of the marshes in association with small areas of floodwater, but

these dispersed as the marshes dried out. Of the commoner breeding waders, Snipe are probably the most sensitive to drainage, and most of the Yare Basin was clearly too well-drained to support them. Additional factors may be the scarcity of rank, rushy growth, often preferred by nesting Snipe, and the lower moisture holding capacity of alluvial, not peaty, soils.

Redshank: 223 breeding pairs recorded, mainly concentrated around Breydon Water, the Lower Bure and Chedgrave Island. The Yare Basin is of regional importance for Redshank.

Yellow Wagtail: 457 breeding pairs were recorded, including 43 pairs St Benet's Level, 41 pairs Upton Marshes, 48 pairs Acle Marshes, 70 pairs Chedgrave Marshes and a total of 80 pairs Norton, Haddiscoe and Wheatacre Marshes. These were widespread although strikingly absent from much of Halvergate Marshes and concentrated on Chedgrave Island. An association with arable is probably due to a preference for nesting in a dense even sward of young cereals. They were frequently seen flying out of the larger complexes of arable to feed in the grazing areas, presumably on dung flies which are an important food source. The Yare Basin is of national importance for the species.

Additional species recorded included at least 4 pairs of Little Grebes detected at Burgh Castle where up to 12 pairs usually breed. There were another 3 pairs on Chedgrave Island. Small numbers of Canada Geese appeared on the grazing marshes in April and May, together with 3 Egyptian Geese on Belton Marshes in June. Shelduck were common all over the grazing marshes, although only 5 broods had been seen by the end of the survey. After the wintering Wigeon concentrations had dispersed, at least 6 remained on Chedgrave Island; 2 of these were "pricked". Teal were present at several localities in April, but none was found breeding on the grazing marshes. A pair of Pintail was present near Breydon in early April, but were not seen subsequently.

A few Tufted Duck were in the vicinity of the main waterways throughout the period April to June, although none was proved to breed. Moorhens were very common and widespread on dykes throughout the entire area. Coot were fairly common on the wider dykes and collector drains, especially on Chedgrave Marshes and Burgh Castle Marshes.

A pair of Ringed Plovers bred on a marsh adjacent to Breydon. Golden Plover were recorded on passage in April; 400 of the Northern race at Wickhampton Marshes was the largest concentration. A pair of Black-tailed Godwits was present on a wet meadow in April, but despite the fact that this was one of the few areas where surface water remained throughout the breeding season the birds did not stay to breed. Whimbrel occurred on passage in late April and early May, with a total of over 70 at six localities. Other passage migrants included Green Sandpiper, Wood Sandpiper, Spotted Redshank and Greenshank.

The likely implications of a barrier scheme upon the ornithological interest of the area

It has been forecast that a guaranteed flood prevention scheme, such as that provided by the construction of a barrier across the River Yare, could accelerate the rate at which "marsh improvement" is carried out by individual farmers. In an area of about 21,300 ha examined during the Yare Basin Flood Control study (1977), about 4800 of grazing marshes had been "improved" by the end of 1977. It was considered that with the implementation of a barrier scheme a further 9000 ha would probably be subjected to agricultural development within 20 years, with another 5,900 ha being converted in the succeeding 20 years. Even so, it has been estimated that up to 12,000 ha would ultimately be reclaimed, even without additional flood protection, although the likely time scale for this process is not indicated.

Agricultural improvement is liable to affect the breeding waterbirds of the area in two main ways — through drainage and through an increase in the areas under cultivation.

On "improved" areas, the water table is generally lowered to about 1½m below the ground surface and this clearly has adverse effects on breeding waterfowl. De Jong found that the optimum spring water level for four species of wader breeding on a meadow bird reserve in the Netherlands was about 20cm below surface. Ditches are generally very deep with tile drains feeding into them and only very shallow water in the bottom. Herbicides are used to keep them clear of emergent aquatic vegetation and they therefore support very few breeding waterfowl. As drainage becomes more efficient, there is a decrease in the length of the ditch systems as old ditches are filled in, giving larger, more uniformed fields with much less marginal vegetation.

Areas of surface water on the fields in early spring are liable to be more rapidly lost due to the increased drainage capacity. Spring flooding may be important in inducing migrant and wintering waterfowl to stay and breed and Thomas found that the size of the breeding populations of some ducks on the Ouse Washes was governed by the amount of floodwater available at that time.

Loss of surface water would probably also affect the breeding success of some species. Damp hollows, close to nesting areas which persist into the early summer may be very important in providing feeding for broods of young waders which, when flightless, are less mobile than adult birds.

Much of the improved area would probably be devoted to growing cereal and other crops though there would probably also be some areas of high yield, reseeded grasses used either for silage production or for intensive grazing. Any increase in arable would probably adversely affect breeding Redshank, though the likely effects upon some other waterbirds are difficult to interpret. Oystercatcher would probably benefit from an increase in the areas under cultivation, though as grassland is known to be favoured after the young have hatched large areas of unrelieved arable may be unsuitable for nesting. Klomp commented that Lapwings were absent from large complexes of arable in the Netherlands, for perhaps this reason. As Yellow Wagtails generally feed in association with cattle and often nest in cereal they could remain unaffected, provided that a 'balance' between these two forms of land use is achieved.

Reseeded grasses, which form an even sward tend to be less suitable for nesting waders such as Redshank, since tussock-forming species which offer good concealment for nests are eradicated. In addition, early mowing for silage leads to the destruction of the nests and young of many wildfowl and waders.

The continuing trend towards drainage and conversion to arable poses potentially serious threats to the scientific interest of the Yare Basin regardless of whether the barrier scheme is implemented. It is clear, however, that the projected increase in the rate and possibly the overall extent of agricultural development which might accrue from such a scheme would exacerbate the problems of nature conservation.

Importance of the Yare Basin for breeding waterbirds

In this assessment of its importance, the Yare Basin has been considered in its entirety. Despite its size, it may logically be regarded as a single site, as it forms a zone distinct from the surrounding uplands over which the vegetation and land use are fairly uniform.Indeed, much of the importance of the area stems from its extensive, unfragmented nature. The Yare Basin is of national importance for its breeding populations of two species, Shoveler and Yellow Wagtail and of regional importance for its concentrations of breeding Mute Swan, Oystercatcher, Lapwing and Redshank. As the area supports 3 scarce breeding species, Gadwall, Garganey and Pochard, it also attains regional importance in this respect.

As the river ronds, which hold over a quarter of all breeding Redshank would probably remain unaffected by reclamation, they should be retained as reserves so that some of the interest of the area would be maintained, at least for this species. However, acquisition of small areas of grazing marsh as reserves could, without any form of conservation policy for the bulk of the area, fail to safeguard the national or regional importance of the Yare Basin for other breeding waterbirds which are scattered at a low density.

Continued agricultural development will be likely to take place in a piecemeal fashion without planning control and it will therefore be extremely difficult to monitor its progress and its effects on the breeding bird community. There is a need for both farmers and conservationists to agree upon a comprehensive land use strategy which would fully take account of the nature conservation interest of the area.

A WILD GOOSE STORM DISASTER

SOON after dawn on the morning of January 3rd 1978 a violent storm crossed East Anglia. In its wake 140 wild geese lay dead in fields, along hedgerows and on the road. These were mainly Pink-feet but included Canada, Greylag, 2 Brent and one Bean goose. The following account of events leading to this avian disaster, and the conclusions reached, have been compiled after examining available meteorological and ornithological data.

Over Norwich and east Norfolk the morning of January 3rd dawned bright and breezy, but in the west of the county storm clouds rolled out of the darkened western sky, towering above The Wash towards Lincolnshire. This was not an isolated build-up of cloud but a line of many active storm centres joined along a vigorous and extremely mobile cold front. This front marked the boundary between warm moist air, which had lain over East Anglia overnight, and cold polar air rushing south-east across Britain from the north-west Atlantic. Temperatures dropped from 8°C in the warm air to 2°C behind the front. Over northern Britain this frontal boundary was relatively inactive but approaching East Anglia it rapidly intensified as a renewed surge of cold air displaced more and more warm air upwards through the atmosphere (Fig. 1). This whole frontal airmass became completely unstable, resulting in the formation of numerous cumulonimbus or "thunderstorm" clouds. Worse was to come.

When air is forced to rise very rapidly a localised spinning motion may be induced. The atmospheric forces acting on the rising air are identical to those which produce small whirlpools in the bath as water rushes down the plug-hole. In the atmosphere such spinning columns are called dust devils, whirlwinds or tornadoes, depending on size. In Britain the largest are normally only a few tens of metres in diameter and last for just a few minutes. In America, large tornadoes may persist for up to an hour and cause severe damage along a trail ½ Km wide.

On the morning of January 3rd the cold air surging across East Anglia at nearly 50 mph caused sustained uplift of the warm air. This produced vigorous upcurrents and several whirlwinds and small tornadoes were reported. The first was in Hull just before dawn and 2 hours later a larger tornado struck the Newmarket area inflicting considerable damage to houses, cars and a railway signal box. (Chorley L.G., *Meteorological Magazine,* No. 1275, Vol. 107, Oct. 1978). Aubrey Buxton writing in the *NARVOS Report for 1978* states that Michael Hunt, the senior forecaster with Anglia TV, was informed by Dr Meaden, Director of the Tornado Research Organisation, "that at least 5 tornadoes were reported over northern East Anglia on the morning of January 3rd and considers that further unreported tornadoes were more

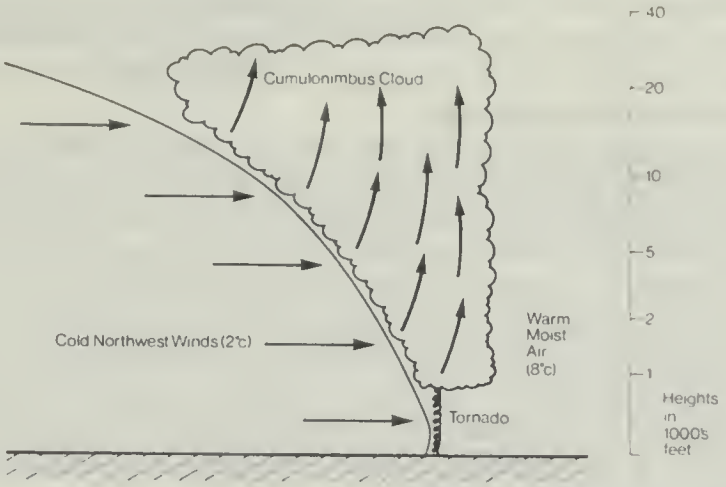


Fig. 1. Cross-section through the frontal zone illustrating how the surge of cold air displaces the warm moist air. Cumulonimbus clouds are formed providing the air is unstable.

Fig. 2. Corridor along which the dead geese were located.

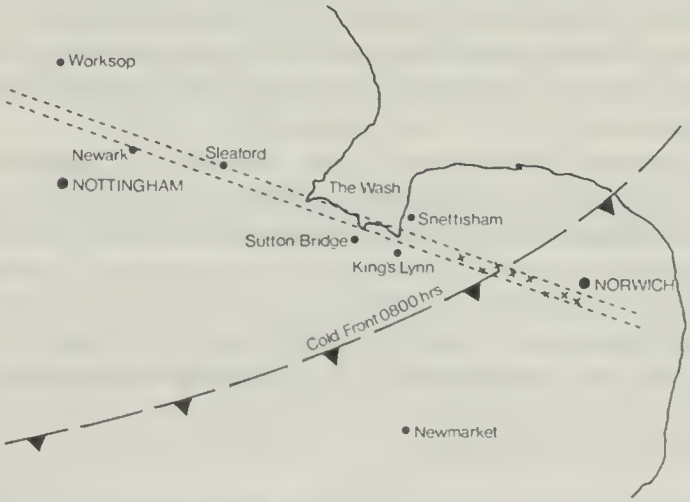


Fig. 3. The projection of the "kill corridor" northwestwards across the southern boundary of The Wash and into Nottinghamshire. A cross is plotted in each area where dead geese were located.

than likely''. Hence, it is probably reasonable to assume that, although no major tornadoes were sighted over The Wash or NW Norfolk, small tornadoes or funnel clouds could have developed. (A funnel cloud is a column of spinning air below a cumulonimbus cloud, but it does not reach the ground. Friction near the earth's surface breaks up the spinning motion).

The scene now changes to the salt-marshes surrounding The Wash, or possibly a field in Lincolnshire. A flock of wild geese is grazing or perhaps, as dawn breaks, they are flighting around The Wash between roosting and feeding areas. Out of the dark western sky the storm approaches, heavy rain and sleet lash down, thunder and lightning reverberate across the sky, hailstones crash around and the squalls reach 50 - 60 mph. There is panic. Many geese fly east, running before the storm, trying to escape its fury.

Suddenly, geese are sucked aloft like toy balloons. Caught in a whirling tornado their lungs are decompressed by the explosive drop in atmospheric pressure. Up, up they go. To what altitude is unknown but gliders accidentally caught in tornado clouds have been reported as experiencing uncontrollable uplift of over 10,000 ft! For a lightweight goose it could be much more.

The largest concentration of dead geese (105) was found between Castle Acre and Great Massingham, with Dereham 2, near Gressenhall 4 (including a Bean Goose), Wendling 14, Carlton Forehoe 3, Hethersett 10, Swardeston 1 and Mattishall 1 (Fig. 2). By the time the Mattishall bird was reported it had been cooked and eaten! Four birds were sent by Aubrey Buxton for post mortem examination *(NARVOS Report for 1978).* All four had ruptured livers and haemorrhaging, the result of blast, precussion or de-compression. This, it is reported, would alone have been enough to cause death but each one also had extensive internal injuries and bone damage, indicating that they crashed to earth from a considerable height.

The birds picked up dead were found along a relatively narrow corridor between Castle Acre and Swardeston. When extended north-west this corridor crosses southern parts of the Wash, the Welland estuary and into Nottinghamshire, passing close to Sleaford and Newark (Fig. 3). It is highly probable therefore, that the birds involved in this accident were feeding on the salt marshes or mud-flats along the southern shores of the Wash, perhaps part of the Snettisham flock which is known to feed extensively between Snettisham and Nene mouth near Sutton Bridge, and whose numbers declined that day from over 4500 to about 500. Four of the Canada geese recovered carried B.T.O. rings. All four had been ringed near Worksop, Notts, in 1970, 1971 and 1976 (two), and speculation arose that they could have been picked up by the storms over Nottinghamshire. This is possible but seems unlikely for three reasons: the large number of Pink-feet involved (there are few records of large concentrations in Notts); no reports of dead geese in Lincolnshire; and most important, the storms had passed the Worksop/Nottingham area before reaching maximum intensity.

It is therefore concluded that the most likely sequence of events was that a flock of geese flighting along the southern perimeter of The Wash at dawn, or panicked into the air by the approaching storm, was overtaken by a tornado or funnel cloud and forcibly sucked upwards to a considerable altitude, which caused death or unconsciousness. Their involuntary return to earth was then only a matter of time and occurred along a 30 mile path from near Castle Acre to just south of Norwich.

Footnote: Later that day observers at East Tuddenham, Costessey and Reepham reported skeins of geese numbering from 2 to 35 flying in a northwesterly direction, presumably finding their way ''home''.

Wally Thrower

Bird Ringing Report

AFTER ten years, John Bruhn has regrettably decided to retire from the editorial committee of the *Norfolk Bird Report*. During this time, his expertise in the production of the Ringing Report has been invaluable, in particular his interpretation and comments on the individual recoveries.

The number of recoveries notified during 1979 was higher than usual, due to the hard weather during the 1978/79 winter, and several wader recoveries from previous years. Of particular note were Knot, Bar-tailed Godwit and Turnstone to USSR and Spotted Redshank to Italy. Passerine movements within the British Isles produced Blackbird and Linnet recoveries in Scotland and 2 Sand Martins found at the same Welsh lake. Pride of place, however, must go to the Song Thrush recovered in Estonia.

Over the years many recoveries have resulted from the more commonly ringed species. In future, it is planned to include in the annual ringing report a short analysis of the recoveries to date of a selected species as they relate to Norfolk. Any other ideas concerning the ringing section of the *Norfolk Bird Report* will be most welcome.

Moss Taylor

Cormorant

The majority of Norfolk recoveries are of birds ringed in the Farnes; this is the first from a Scottish breeding site.

Clett Stack, Shetland 1.7.79 — Tottenhill GP (shot) 3.11.79

Heron

Of the five heron recoveries reported during 1979, two were found in their tenth year. The one distant recovery was unusual in moving NW.

Strumpshaw (pullus) 12.5.70 — Chew Moor, Bolton, Lancs. 18.4.79

Mallard

An interesting case of a bird wintering in different areas in consecutive winters.

Sonderho, Fano, Denmark 3.12.78 — East Dereham 26.12.79

Pintail

All previous Norfolk recoveries of foreign-ringed birds have been from Holland, and this one probably represents hard weather movement.

Haademeeste, Parnu, Estonia (pullus) 16.6.77 — Cley (shot) 14.2.79

White-fronted Goose

There have been very few recoveries of grey geese in Norfolk.

Lijtshuizen, Friesland, Netherland 10.1.76 — North Wootton 1.1.77

Kestrel

One of the siblings of the bird recovered at East Runton, was found dead near Matlock, Derbyshire in Sept. '79. An interesting comparison of post-juvenile dispersal.

Ufton Fields, Southam, Warwicks. (pullus) 18.6.79 — East Runton (dead) 13.8.79

Moorhen

The seventh recovery of a Dutch-ringed moorhen.

Worner en Jisperveld, Noord Holland, Netherland (pullus) 12.7.78 — Acle (dead in coypu trap) 19.11.78

Lapwing

Two Norfolk-reared birds wintering in opposite directions.

Lower Kelling (pullus) 31.5.77	Alfreston, Derbyshire 15.11.79
Kings Lynn (pullus) 3.5.75	Brest, Finistere, France 10.1.79

Knot

The majority of Knot wintering in Britain are of Greenland/Canadian origin. The recovery from Zhigansk (6915 kms from North Wootton) is the first evidence by ringing recovery that Siberian birds reach Britain. The second bird was also presumably of Siberian origin and was shot on, or on route to, its wintering area in Southern Africa.

North Wootton 11.8.71	Zhigansk, Yakutsk, USSR (66 42'N 123 00'E) 11.6.74
Langebaan, Cape Province, South Africa 24.1.76	Wolferton (control) 19.8.77

Curlew Sandpiper

The first foreign-ringed Curlew Sandpiper to be found in Norfolk.

Lista, Vest Agder, Norway 1.9.78	Wisbech SF (control) 16.9.78

Dunlin

The continuing saga of the bird first reported in the 1977 *NBR* p.230.

Snettisham 13.4.68 & 4.4.69	Pori, Finland 21.7.75
	Lake Vattern, Sweden 25.7.75
	Brean, Somerset 12.2.78

Bar Tailed Godwit

The African recovery is the first indication that British-ringed Bar-tailed Godwits use this major wintering area for the species, whilst the second recovery was presumably of a bird on passage from a breeding area much farther east.

Wolferton 16.9.78	Port Etienne, Mauritania 11.12.78
North Wootton 23.7.78	Belomorsk, Karelia, USSR 30 9.79

Spotted Redshank

The first recovery in Italy of a British-ringed Spotted Redshank.

North Wootton 19.8.78	Bologna, Italy 21.3.79

Redshank

Only the fifth British-ringed Redshank to be reported from Portugal.

Terrington 7.9.75	Aveiro, Portugal 30.8.79

Turnstone

Wash-ringed birds recovered from three well scattered localities; representing the first Turnstone recovery showing movement between Britain and the USSR, only the second British-ringed Turnstone from Ghana and the fifth from Morocco.

Snettisham 4.8.74	Anloga, Ghana 5.1.78
Snettisham 4.8.74	Wolferton 11.8.75
	Oualidia, Morocco 24.1.78
Snettisham 17.8.74	Gt. Ainov I., Murmansk, USSR 3.6.78

Black Headed Gull

Recoveries involved winter movements between Norfolk and Holland (2), Denmark (4), Norway, Finland, Latvia, Estonia (3), Poland (2) and Germany (3). The two reported in full illustrate early spring return to breeding area and early autumn return to Norfolk respectively.

Sheringham 24.1.79	Esbjerg, Jutland, Denmark 11.3.79
Sheringham 3.1.79	Breydon Water (dying) 15.7.79

Common Gull

Norwich 4.12.77	Insel Barther Oie, Rostock, Germany 25.5.79

Herring Gull

Ord of Caithness, Highland 3.7.66	Blackborough End 16.9.79

Common Tern

Hardley Flood (pullus) 9.7.78	Monrovia, Liberia (caught) 19.3.79

Kingfisher

Colney (pullus) 1.6.76	Marlesford, Suffolk 10.8.76

Sand Martin

Although juvenile Sand Martins are known to disperse widely after leaving their natal colonies, it is remarkable that two should be reported from the same Welsh lake.

Leziate 11.7.79	Llangorse Lake, Merthyr Tydfil, South Wales 28.7.79
Aldeby 13.7.79	Llangorse Lake 4.8.79
Colney 10.5.75	Torreblanca, Castellon, Spain 5.9.77

Swallow

Included is only the fourth British-ringed Swallow to be recovered in Norway.

Happisburgh 10.5.79	Selby, N. Yorks. 7.7.79
Happisburgh 22.5.79	Cannock, Staffs. (control) 9.9.79
Thornham 18.9.78	Sogndal, Norway 19.5.79
Gayton 27.6.78	Luzarches, France (control) 16.9.79

Blackbird

Autumn and winter ringed birds were recovered in Holland, Germany (3), Finland (2), Sweden (3) and Norway, while foreign-ringed controls came from Holland (4) and Finland. Details are given of an 11 year old bird and an unusual movement to Scotland.

Hetersett 4.1.69	Norwich 15.12.79
Sheringham 28.10.78	S. Queensferry, West Lothian 24.3.79

Fieldfare

The first two recoveries indicated hard weather movement, while the others are to and from the breeding areas.

Sprowston 26.1.79	Brancaster 13.3.79
Sprowston 28.1.79	Envermeu, Dieppe, Seine Maritime, France 27.2.79
Saddlebow 17.12.78	Tvarsele, Sweden 17.5.79
Saddlebow 27.1.79	Evijarvi, Finland 23.5.79
Firvensalmi, Finland 10.6.78	Saddlebow (control) 6.1.79

Song Thrush

An interesting series of movements, including the first British-ringed Song Thrush to be recovered in the Baltic States. This latter movement may usefully be compared with the recovery in the USSR (see *NBR* 1978 p.12), which was the first British-ringed Song Thrush movement to Russia.

Sheringham 23.7.77	Pocklington, Humberside 25.5.79
Sheringham 15.10.77	Spurn Point, Humberside 26.10.79
Norwich 19.2.76	Jullouville, Manche, France 16.1.79
Waxham 7.10.78	Otepaa, Valga Region, Estonia 30.8.79
Gillingham (pullus) 28.5.79	Chateauneuf, D'Ille-et-Vilaine, France 16.1.79

Sedge Warbler

Gibraltar Pt., Lincs. 4.5.77	Earlham (control) 22.7.77

Reed Warbler

Leigh on Sea, Essex 28.7.78	East Ruston (control) 11.7.79

Whitethroat

Sheringham 12.5.79	Saltfleetby, Lincs. (control) 1.6.79

Blackcap

Included is a five-year old bird, which is uncommon amongst *sylvia* warblers.

Dungeness, Kent 1.5.79	Gillingham (control) 18.5.79
Colchester, Essex 18.9.79	Tichwell (control) 25.9.79
Happisburgh 29.4.78	Oostende, West Flanders, Belgium 5.5.79
Winterton 11.9.74	Marrakech, Morocco 22.6.79

Willow Warbler

Hoboken, Antwerpen, Belgium 8.8.77	Great Yarmouth 28.6.78

Pied Flycatcher

The first Norfolk-ringed bird of this species to be recovered in North Africa.

Hunstanton 19.8.77	Ajdir, Kenifra, Morocco 7.4.79

Treecreeper

Any recovery of this species is surprising!

Titchwell 6.10.78	Hunstanton (control) 2.4.79

Starling

Recoveries followed the usual well established pattern.

Chaffinch

A bird still alive in at least its tenth year and two foreign-ringed controls.

Holme 29.4.70	Holme (retrapped) 4.2.79
Svanninge, Bakker, Denmark 14.7.78	Titchwell (control) 22.11.78
De Koog, Texel, Netherland 24.10.78	Gillingham (control) 28.1.79

Greenfinch

Included is an interesting series of hard weather movements to Essex.

Gillingham 28.12.78	Harwich, Essex (dead) 25.1.79
Gillingham 23.12.78	West Mersea, Essex (dead) 10.2.79
Gillingham 16.12.78	Colne Pt., Essex (control) 24.2.79
Exeter, Devon 2.3.75	Wymondham (shot) 25.4.78

Siskin

Sheringham 8.4.76	Otterburn, Northumberland 19.5.79

Linnet

A difficult movement to interpret!

Gillingham (roost) 28.10.78	North Ronaldsey, Orkney (control) 18.4.79

Redpoll

Only two distant recoveries were reported during the year.

Sheringham 4.4.77	Wolverhampton, West Midlands 8.6.79
Boitsfort, Brabant, Belgium 9.11.76	Thetford 28.6.77

Reed Bunting

Titchwell 21.1.77	Colchester, Essex 12.1.79

Classified Notes

These notes are based on Birds of Norfolk (revised edition 1977) where fuller details regarding status, distribution, migration and ringing recoveries may be found. Important records for Wisbech Sewage Farm (part of which is on the Lincolnshire side of the county boundary) have been selected from the files of Cambridge Bird Club. Fuller details of Fens records may be found in the Cambridge Bird Club Report for 1979.

The order used is that of Professor K. H. Voous (1977) List of recent Holarctic Bird Species. Observations refer to 1979, unless otherwise stated. To save space, all but the most essential initials have been omitted. Records are of single birds unless otherwise stated.

Red-throated Diver: North/East coasts: Extreme dates May 26th and Sept. 15th. Concentrations included 80 off Sheringham Jan. 27th and 90 east there Dec. 29th. Following Feb. blizzards singles on Yare at Postwick 15th and on Waveney at Gillingham 16th.

Black-throated Diver: More records than usual with an exceptional assembly of 36 off Winterton March 17th. Total of 19 inland records Jan. to April at Lound, Herringfleet, St Olaves, Ormesby, Rollesby, Breydon, Berney Arms, Lower Bure, Wymondham College (quickly released at Cringleford) and Strumpshaw; also a late bird Rockland Broad till May 15th. Extreme coastal dates April 27th and Sept. 28th.

Great Northern Diver: North coast/Wash: Over 40 records up to May 15th and from Oct. 7th. Scarce on East coast with only two observations. Inland at St Olaves Feb. 3rd, Downham Market on 24th and Pentney Dec. 23rd—26th.

Little Grebe: Broads: Breeding records from Breydon, Haddiscoe Island, and Muck Fleet (Flegg Broads).Fifty together on partly frozen Hickling Broad Jan. 28th. Wash: Peak of 75 at Snettisham in Nov; one on sea Hunstanton Jan. 2nd.

Great Crested Grebe: Wash: Peak autumn count of 135 between Heacham and Holme Oct. 27th. Broads: Unusual end of year build-up at Filby with 27 Nov. 30th, 29 Dec. 6th and 43 on 12th.

Red-necked Grebe: A large scale influx from mid-Feb. (with a few from beginning of Jan). Between then and April 18th recorded at following 42 localities (maximum numbers in brackets apart from singles): Brancaster, Burnham Norton, Breydon (4), Burnham Overy Staithe, Cley, Colney GP, Denver Sluice, Downham Market Relief Channel (2), Filby Broad, Gillingham, Gorleston, Gunton Park, Happisburgh, Hickling Broad (3), Horsey Mere (3), Hunstanton-Holme (10), Holme Broadwater, Haddiscoe New Cut, King's Lynn (2), Lound Waterworks (4), Lyng Easthaugh GP, Magdalen (2), Narborough, Ormesby Broad, Pentney GP, Ranworth Broad, Rockland Broad (3), St Germans, Stow Bridge (2), Stoke Ferry, St Olaves, Salthouse Marsh, Snettisham GP (6), Sheringham (2), Strumpshaw (2), Smallburgh, Titchwell (3), Welney (2), West Walton (3), Weybourne, Wells, Wiggenhall St Mary, Yarmouth Lower Bure (4) and Yarmouth harbour entrance.

When influx at its peak, possibly a county total of 70. Casualties included singles dead at Breydon, Cromer, Holme, Sheringham and Strumpshaw.

N/E coasts: Autumn total of 20 birds from Aug. 25th at Brancaster, Cley, Happisburgh, Holkham, Hunstanton, Sheringham, Snettisham, Titchwell, Walcott and Winterton. Inland: Lyng Easthaugh GP Dec. 25th.

Slavonian Grebe: Noticeable influx Jan. to March when recorded as follows: North: Holkham, Cley, Titchwell, Holme, Brancaster, Thornham, Sheringham, Wells and Blakeney. Wash: Snettisham, Magdalen, and Hunstanton. Fens: Welney and Downham Market — Stow Bridge. East: Yarmouth and Gorleston. Broads: Potter Heigham, Filby, Rollesby, Hardley, Hickling, Breydon, Rockland, Lower Bure, Strumpshaw, and Horsey. Inland: Witton, Coston and Lyng Easthaugh. Records mostly of singles, but 4—5 at Hickling most of March and county total of 40 recorded. A few remained until mid-April.

Sept. coastal records included 3 Happisburgh on 23rd.

Black-necked Grebe: North: Brancaster (dead) March 23rd, Mundesley Nov. 18th. East: Horsey Feb. 9th, Hickling March 6th, Walcott Oct. 24th. Inland: Lyng Easthaugh Jan. 4th and April 2nd. Breck: Stanford Nov. 25th. Fens: Tottenhill Oct. 4th—5th.

Fulmar: North: Total of 60 young counted between Weybourne and Cromer in Aug. (Weybourne to Sheringham 34, Sheringham to West Runton 6, West to East Runton 7, East Runton to Cromer 13). Also bred at Hunstanton but young not counted; 14 returned there Nov. 17th. East: Bacton probably bred and 3 pairs nested at Happisburgh raising 3 young. Blue-phase bird Sheringham—Weybourne Jan. 16th—June 24th and Nov. 22nd. Inland: St Olaves Aug. 28th.

Cory's Shearwater: North: Cley July 27th. (HJB, GRW). Other records still under consideration.

Great Shearwater: East: Bacton/Paston Oct. 16th (RC, MF, KB).

The first recorded Red-necked Grebe irruption took place early in 1865 following severe weather when no less than 35 brought into Norwich alone were quickly acquired by the bird-stuffers. They had been obtained at Yarmouth, Salthouse and Blakeney. Until 1922 Red-necks again remained scarce, but during the intensely cold Jan. and Feb. of that year local taxidermists were kept busy. At Cley Pashley recorded in his diary "a great many grebes about especially Red-necked which I consider the rarest on this coast; I had in 7 or 8 and might have bought double that number". Gunn of Norwich received 3 Red-necks, whilst Saunders of Yarmouth handled a further 2. At Hickling, the head keeper recorded more grebes than he had ever seen there including 5 Red-necks and 20 Slavonians.

The third recorded influx was in 1937, again in Jan. and Feb. Most impressive totals were in Norfolk and the Red-necks were accompanied by Black-necked and Slavonian Grebes and by Black-throated Divers. At Holkham Lake all five British grebes were on show at the same time. Strong and bitterly cold NE winds had prevailed over Denmark for some days prior to the grebes' arrival and it seems very likely that a freezing Baltic caused the movement. Up to 19 Red-necks remained on the flooded Salthouse levels for seven weeks with as many as 13 at Holkham Lake. Elsewhere in the county ones and twos visited Ormesby, Filby, Horsey and Hickling Broads.

Slavonian Grebes (above) were present in above-average numbers, both on the Broads and along the coast. The Red-necked Grebe (below) was the bird of the year as a result of severe conditions in the Baltic. First arrivals were reported in mid-February and up to six found sanctuary at Snettisham Pits with four at Breydon.

Photos: R. J. Chandler.

This group of Cranes successfully over-wintered in East Norfolk spending each day either on marshland, in winter wheat or in a partly cleared potato field. The birds roosted at the edge of a secret pool in dense reedbeds, returning to feed at first light.

Photos: J Buxton (centre and bottom) and P. R. Allard

Sooty Shearwater: North: Holme Sept. 3rd, 5 on 22nd, Cley Aug. 24th, 4 on 26th, 4 Sept. 22nd, Hunstanton 3 Sept. 22nd and Sheringham Sept. 22nd.

East: Walcott Oct. 23rd, Nov. 5th, Waxham Oct. 14th, Winterton Aug. 26th, 2 Sept. 15th, 4 on 16th and one on 21st.

Manx Shearwater: North: (Mundesley to Hunstanton), peak movements late June (including 30 Sheringham 24th and 31 Hunstanton 29th), end Aug. (100 Holme 27th) and Sept. 22nd (40 Hunstanton and 11 Cley). Wash: Snettisham 2 Sept. 18th and Terrington on 20th.

East: Walcott Sept. 22nd and Oct. 26th, Happisburgh Sept. 23rd, Winterton 3 Aug. 25th, Sept. 16th, 21st and 2 on 22nd. Bird of the Balearic race Sheringham Sept. 22nd.

Storm Petrel: Wash: Snettisham Jan. 1st.

Leach's Petrel: North: Cley Sept. 22nd and Sheringham 4 same date.

East: Winterton April 27th.

Gannet: North/East: Most impressive movements included 215 off Cley Oct. 1st and 400 per hour south off Happisburgh same date. Wash: Snettisham 2 over village Oct. 1st. Fens: Wisbech SF April 27th (Later found dead).

Cormorant: East: up to 3 wintering in Wensum valley and up to 15 likewise in Yare valley at Marlingford.

Fens: Welney 54 Feb. 18th and 49 on overhead cables there March 18th, Saddlebow up to 30 Jan.—March. Wash: King's Lynn (River Ouse) 33 Feb. 17th. North: Holkham Lake 45 to roost Oct. 21st, Wells maximum of 60 Oct. 20th.

Shag: Wash/North/East coasts: At Sheringham following westerly gales high total of 60 east Dec. 19th—31st; otherwise no party exceeded 4. Broads: Rockland April 21st and Dec. 30th, Hickling 1—2 Nov. 23rd and Dec. 8th and Reedham Dec. 16th.

Bittern: Broads: Nine regular boomers compared with 6 in 1978 strongly suggests local birds left the county before Feb. severe weather. North: Cley, male and 2 females raised 2 broods; in addition one established boomer at Titchwell.

Casualties during hard spell at Horsey (2), Hickling, Sutton, Rollesby and Mautby whilst one caught and killed by dogs at Snettisham Jan. 20th.

Little Bittern: North: Cley male May 20th (DJF, SJMG, JBK, TAW).

Night Heron: East: Winterton May 13th (PRA).

Little Egret: North: Cley May 30th (JTB, THE, ERP).

Great White Egret: Broads: Hickling Aug. 10th—18th (RB *et al*), at 2000 hours on 17th observed perched on top of Ling's Mill. The first county record.

Grey Heron: The following heronries were counted. *Borders of Wash:* Snettisham 16. *Breck:* Didlington 7 and Shadwell 4. *Fens:* Hilgay 30 and Islington 71. *Broads:* Hickling 13 in Sounds Wood and one in Waggonhill, Wroxham Bridge Broad 8, Ranworth 5 and Halvergate Engine House Carr one.

Purple Heron: North: Cley/Wiveton May 16th—26th (WB *et al).* Broads: Hickling May 4th/5th (many observers).

Black Stork: East: Breydon July 31st (PRA). The third observation in three years.

White Stork: North: Hunstanton—Wells April 7th, (PWA, SCB, SMP *et al),* Overy Staithe 2 Sept. 21st (CW). West: Shouldham April 9th/10th (AEV).

Spoonbill: North: Cley April 11th (2) and 18th/19th, May 22nd—26th, June 5th—12th and July 21st. Broads. Hickling April 11th/12th (2) one of which had orange coloured rings on each leg, May 11th (2), May 29th/30th (3), June 16th and July 13th (one) and Aug. 6th (3). East: Winterton May 12th. Central: Stratton Strawless west April 3rd.

Bewick's Swan: Recorded up to April 7th and from Oct. 22nd. As usual largest concentration in Fens at Welney where 1200 throughout Jan.—Feb. with peak count (complete Washes) of 2300 in mid-Jan. — a new record; 700 present at Welney through Dec. Wormegay 150 feeding on winter wheat during Feb.

East: Total of 271 in Berney Arms area Feb. 26th including 2 yellow-dyed birds ringed at Slimbridge Jan. 16th; also 2 different yellow-dyed birds in Lower Bure marshes March 17th/18th. Between March 3rd and 5th total of 491 in Breydon area of which 320 headed out to sea. Haddiscoe records include 20 (2 dyed yellow) Feb. 11th, 48 March 8th and 20 on 27th. Postwick 9—11 including two with orange rumps mid-Feb. Geldeston 140 March 2nd.

Broads: Rockland, up to 21 Feb. 3rd—March 1st (2 with yellow wingtips on 17th); Filby 46 Jan. 2nd roosting on Broad with peak of 109 Jan . 27th; Hickling 32 Nov. 11th and 89 Dec. 12th.

Breck: 2—4 at Stanford and Fowl Mere Nov.—Dec.

North coast/Wash: Maximum of 50 Snettisham in Jan. Westerly movements at Titchwell Dec. 12th (50), Sheringham Dec. 22nd (43), and Cley Dec. 23rd (25).

Easterly exodus also noted Lyng Easthaugh (18 March 5th), East Tuddenham (44 March 21st), Reepham (50 March 22nd) and Hickling (72 March 27th).

Whooper Swan: Recorded to May 2nd and from Oct. 24th. Largest numbers in Fens at Welney where new peak of 114 at beginning of year and 75 in Dec. Broads: Martham/Heigham Holmes 18 in Feb. and Horning 11 in Jan. East: Breydon 8 in Feb. North: Hunstanton 19 Jan. 4th and Holkham 11—13 Feb.—March. Wash: Snettisham 16 Jan.—March.

Bean Goose: Unusually high county total of over 400 in opening months. East: Up to 141 in usual Yare valley area till March 11th; first returned Nov. 22nd and 127 by Dec. 22nd. In addition, on Feb. 3rd when 116 at most favoured marsh 81 at Halvergate and 26 at Berney Arms (total of 223) and also 122 Winterton—Horsey making a total of 345 in East Norfolk. A total of 135 in Halvergate area Feb. 5th may have included Yare valley birds as none there that date. Winterton—Horsey flock remained all Feb. with 110 March 1st and last 14 on 11th (same final date as for Yare valley).

North: Holkham up to 57—60 early Jan. to mid-Feb. with peak Feb. 4th—11th. Sheringham 23 east Feb. 25th; Holme 7 Feb. 4th.

Pink-footed Goose: East: Breydon 16 Jan. 14th/15th is only noteworthy record. Wash: Snettisham 1800 Jan., 1700 Feb., still 1400 March 10th, 210 April 7th and last 15 on 21st; 54 back Oct. 31st, 1250 Nov. and 3500 Dec. North: Wells/Holkham up to 37 mid-Jan. to Feb. 11th.

White-fronted Goose: East: Recorded up to March 4th and from Dec. 22nd in Yare valley, Haddiscoe, Horsey, Halvergate, Breydon, Potter Heigham and Hickling. Largest group 74 Breydon Feb. 2nd.

North: Holkham/Wells 200 Jan. 27th with 250 mid-Feb. and 76 Dec. 30th. Cley up to 26 till Feb. 24th. Hunstanton 56 Jan. 29th, 29 Dec. 16th and 35 on 23rd. Wash: Snettisham 10 in Feb. and 12 in March. Fens: Welney 10 Feb.

Greenland White-fronted Goose: North: Sheringham westward movement April 21st (one), 22nd (3) and May 7th (one).

Barnacle Goose: East: Yare Valley Dec. 1st—31st and Horsey Feb. 6th and 11th. Berney Arms/Breydon 2 Feb. 25th/26th and 8 March 29th/30th. Halvergate 11 Feb. 22nd. Winterton 11 Jan. 11th. North: Holkham 4 Jan. 27th—Feb. 19th with 6 on 10th.

Brent Goose: Recorded each month. Maximum numbers at regular localities: Breydon 56, Cley 1500, Wells 2—3000, Brancaster 1500—2000, Hunstanton 500, Snettisham 1100, North Wootton 750, Ouse Mouth 1000 and Terrington Marsh 600.

Pale-bellied birds Jan.—Feb. at Cley/Salthouse (15—20), Wells (2) and Stow Bridge (4).

Egyptian Goose: Recorded at 29 localities with most impressive assemblies at Flitcham-Hillington (78 Nov.), Burnham Overy (91 Jan.) and Holkham (200 July).

Shelduck: Wash: Snettisham 2612 in Jan., 3075 in Nov. North: Scolt Head 800 in Jan. East: Breydon record count of 1357 Jan. 3rd.

Breeding records away from coast include single pairs at Aldeby, Surlingham, Stanford Water, Beechamwell, Tottenhill, Pentney and Leziate with 2 pairs at both Flitcham and Weasenham and 3 pairs in Gunton Park.

Mandarin: 1—4 at Cley, Coston GP, Hoveton Great Broad, King's Lynn, Smallburgh and Winterton.

Wigeon: Fens: Welney 11,000 at beginning of year declined rapidly with onset of severe weather; 16,000 by year end. North: Cley 5,000 Nov. Wash: Snettisham peak of 2590 Jan., 2240 Feb. and 1178 Oct. East: Horsey 1,000 Jan./Feb. Breydon 4500 Jan. 15th—Feb. 26th. Yare Valley 2200 Jan. 6th—9th.

American Wigeon: East: Breydon Feb. 19th (PRA).

Gadwall: Largest counts: Brecks: Stanford Water 150—200 Sept. 11th. West: Hillington 75 Nov. 4th. North: Gunton Park 680 Sept. 29th, 610 Oct. 13th but only 18 on 27th.

Teal: Fens: Welney 1470 mid-March.

Pintail: Wash: Snettisham 412 Jan. North: Cley 150—200 Nov. East: Breydon 158 Feb.

Garganey: Spring arrival from April 10th (Halvergate) and subsequently at Cley, Haddiscoe Island, Wickhampton, Breydon, Limpenhoe, Cantley, Winterton, Sheringham, Snettisham, Filby, Wells, Hickling (3 small young found later), Welney (nests flooded out) and Wisbech SF.

Shoveler: Wash: Snettisham 32 early Jan. Fens: Welney 578 mid-March. Breck: Narford 150 Dec. 26th. North: Gunton Park 45 Oct. 15th.

Pochard: Fens: Welney 500 March 11th. Breck Narford 400 Dec. 26th; little information on breeding success in this area. East: Haddiscoe Island 3 broods and Strumpshaw one brood.

Tufted Duck: Winter counts include 105 Mickle Mere and 157 Snettisham both in March, 140 Hilgay Dec. and 222 King's Lynn—Magdalen Feb. Breeding records most complete in West and total of 22 broods at Downham Market (Flood Relief Channel), Tottenhill GP, Leziate, Saddlebow (Flood Relief Channel), Blackborough End, Wormegay, Foulden Common, Cockley Cley, Narborough, Beetley, Hillington and Thompson.

Elsewhere total of 24 broods at Cley, Lenwade, Taverham, Lyng Easthaugh, Coltishall, Hickling and Martham.

Scaup: North/East coasts: Higher counts than usual including total of 200 moving east off Sheringham daily between Jan. 1st and 7th when 49 off Mundesley, 40 off Brancaster and 97 off Hunstanton. Peak of 150 at Holme Feb. 3rd and 40 still at Heacham March 4th.

Eider: Largest gatherings for main localities: Yarmouth/Gorleston 22, Titchwell 200, Brancaster/Scolt Head 80 and Hunstanton 200.

Long-tailed Duck: Wash: Hunstanton monthly totals: Jan. 40, Feb. 5, Oct. 2, Nov. 5 and Dec. 22. North: Holme 35 in Feb. and 20 in March; Titchwell 15 in Nov.

Common Scoter: North: Hunstanton 420 Jan. and 700 Feb; Titchwell 200—250 Nov./Dec.. Inland: St Olaves Feb. 14th (strong easterly winds), Pentney 2 drakes April 7th, and Ranworth Broad 9 July 12th and one Dec. 12th.

Velvet Scoter: North/Wash: Recorded monthly except July. Largest number between Holme and Titchwell including 30 April 2nd. East: Winterton 9 and Gorleston 5. Singles inland at Denver Jan. 28th, Lound Feb. 10th—23rd, Gillingham Feb. 16th,

Saddlebow (King's Lynn) 17th—20th and King's Lynn 18th, Burgh Castle March 2nd. Broads: Ranworth 3 Feb. 22nd.

Goldeneye: Maxima as follows: Wash: Snettisham 71 (March) and 52 (Dec.), Heacham /Hunstanton/Gore Point 180 (Jan). Broads: Martham 31 (March) and Rollesby/Filby 12 (March). East: Breydon 78 (Feb).

Smew: Unusual numbers up to April 9th — majority in Jan./Feb. North: 1—3 at Cley/Salthouse, Hunstanton, Sheringham, Wiveton, Brancaster, Mundesley and Wells. Wash: Snettisham 4—6.

East: Lower Bure 8, Breydon 9, Fritton, Buckenham, Gillingham 2, Haddiscoe 2, West Somerton, Postwick, St Olaves and U.E.A. Broad Earlham. Inland: Bawburgh, Blickling 6. Broads: Filby 2, Horsey 2, Hickling/Heigham Sounds 5—7 and once 9.

Fens: 1—2 Downham Market, Magdalen, Saddlebow, King's Lynn; also 10 over Wisbech SF Jan. 6th.

Red-breasted Merganser: Severe weather in the early part of year resulted in an abundance of records. Wash/North: 50 Snettisham in Feb. (38 in Jan.), 38 at Holme; total of 150—200 at Heacham—Hunstanton March 4th, 68 Heacham Oct. 27th and 78 Brancaster Oct. 28th.

East: Lound up to 5 Feb. 19th—March 11th, Potter Heigham up to 20 Feb. 21st—28th, Strumpshaw 2 Feb. 23rd, Postwick 3—5 Feb. 20th—25th, Trowse 3 Feb. 24th, Wayford Bridge 5 Feb. 25th and Repps 12 March 4th.

Fens: West Walton 8 Feb. 18th, Downham Market 3 Feb. 24th, Wiggenhall St Germans 10 Feb. 18th and 17 March 3rd and 11 on 30th and Denver Jan. 16th.

Broads: Hickling 20 Feb. 18th—April 19th, Ranworth Feb. 2nd, Rockland 3 Feb. 24th and Horsey 13 March 3rd.

Inland: UEA Broad Earlham 5 Feb. 20th and Pentney 7 Feb. 22nd. Breck: Narford 7 most of Jan.

Goosander: Recorded until end of April at almost 50 localities including Filby 6, Potter Heigham/Repps 6, Denver 7, Sheringham 8 maximum together but total of 46 on 13 dates, Rockland 9, Breydon 11, Gorleston 9, Blickling 10, Strumpshaw 12, Hickling 12, Lound 19, Gunton Park 22, Fritton 12, Antingham Pond 7, Gillingham 6, Cockley Cley 9, Stowbridge 24, Stow Bridge-Magdalen 33 and Downham Market 56.

Ruddy Duck: East: Lower Bure/Breydon a duck Jan. 22nd—Feb. 26th. Breydon 3 Nov. 3rd (PRA). Broads: Ormesby March 14th—21st (ADB). Fens: Tottenhill GP a duck Nov. 16th—Dec. 7th. Wash: Snettisham a duck March 17th/18th (RWHG).

Honey Buzzard: North: 1—2 present at two sites from June 3rd, but no proof of breeding. In addition singles at North Walsham July 6th and Cley Sept. 7th.

Black Kite: North: Cromer May 28th (CF, HS).

Additional 1978 record: Cley Oct. 15th (RNH, AWW *et al).*

Red Kite: East: Winterton Feb. 27th (PRA). North: Langham May 28th (PJO).

Marsh Harrier: Nine pairs summered and nested at 8 sites rearing a total of 15 young to flying stage. More than usual at coastal sites in spring and autumn including 6 Holme May 13th, 4 Wisbech SF Aug. 29th, 7 Snettisham Aug. 18th where a total of 12 in Sept.

Hen Harrier: Unique numbers during 1978—79 winter with birds appearing very widely over arable country as well as ranging over marshes, heaths and dunes. Recorded in over 140 localities up to May 18th 1979: Alby, Acle, Aldeby, Boughton, Burgh Common, Bayfield, Brumstead, Blackborough End, Blakeney Point, Blakeney Fresh-Marsh, Barton, Brooke, Brancaster, Burnham Overy, Banningham, Breydon, Buckenham, Belton, Bridgham Heath, Briggate, Burnham Norton, Belaugh, Brettenham Heath, Bodney, Beechamwell, Cley, Costessey, Chedgrave, Castle Rising, Claxton, Cockley Cley, Cawston, Castle Acre, East Ruston, East Wretham, Ebridge, East

Walton, Flitcham, Fritton, Foxley Wood, Foulden, Filby, Feltwell Fen, Felbrigg, Frettenham, Gooderstone, Gillingham, Hilborough, Holkham, Hockwold, Harpley, Hardley Flood, Happisburgh, Haveringland, Heacham, Hickling, Holme, Horsey, Halvergate, Ingham, Irstead, King's Lynn, Kelling Heath, Leziate, Lound, Lynford, Little Cressingham, Long Stratton, Langford, Massingham Heath, Morston, Martham, Mileham, Merton, Mundford, Middleton, Narborough, North Walsham, Northrepps, North Tuddenham, Oulton, Ouse Mouth, Ormesby, Potter Heigham, Pockthorpe, Postwick, Rockland Broad, Rougham, Ringstead, Reedham, Ridlington, Ranworth, Rackheath, Rudham, Roydon Common, Stalham, Stanhoe, Stoke Ferry, Sandringham Warren, Saxthorpe, Southacre, Salthouse Heath, St Benet's Level, Salthouse Marsh, Scolt Head, St Olaves, Smallburgh, Stanford, Snettisham, South Runcton, Sheringham, Somerton, Strumpshaw, Swanton Morley, Surlingham, Stoke Holy Cross, Swaffham Heath, Titchwell, Thornham, Thurning, Thompson, Thursford, Tottington, Threxton, Wolferton, Wortwell, Weybourne, Watton, West Acre, West Tofts, Wells, Wheatfen, Whitlingham, Weeting, Wisbech SF, Witton, Winterton, Waxham, Wickhampton, Wiveton, Wroxham and Woodton.

Totals (excluding roost counts) include 5 at each of the following localities: Blakeney Point, Gooderstone, Hilborough, Hickling, Scolt Head and Snettisham. Communal roosting sites a new feature. Three roosts recorded in North, 2 in NW and one in Broadland with a total of 45 birds. Interesting movements: 18 passing through Sheringham Jan. 4th—April 15th including 10 moving east; also 5 south at Winterton April 22nd.

First in autumn Sept. 15th with maximum of 6 Hickling/Horsey in Dec.

Montagu's Harrier: North: Titchwell female on three dates May 13th—June 2nd and male May 23rd and 27th, Holme May 13th, Aug. 15th, Cley May 7th and Sheringham May 6th. East: Winterton April 21st. Broads: Burgh Castle May 30th, Martham Aug. 4th, Hickling April 29th and May 6th and Horsey male in June. None bred.

Goshawk: Bred at one site and 4 young in nest; first bred here 1975 and annual since. Brecks: Feb. 25th. Broads: Buckenham Nov. 21st (NRJ). East: Horsey Feb. 24th (PRA) and Winterton April 13th (PRA, ADB) associated with movement of 17 Sparrowhawks.

Sparrowhawk: Recorded at 65 sites, but only one breeding locality. Interesting total of 17 south Winterton April 13th.

Buzzard: More than usual especially Feb.—June when recorded at Bacton, Brancaster, Breydon (3), Cley, Dilham, Edgefield, Foulden, Fritton, Haddiscoe, Happisburgh, Holkham, Hickling, Horsey (2), Lound, Martham Broad, St Olaves, Salhouse, Salthouse Heath, Sheringham, Titchwell and Winterton. Large numbers included 5 Sheringham March 24th, 4—5 Winterton March 18th and 4 on 24th followed by 8 south April 1st and 3 on 13th and up to 4 Lound—Fritton Feb. 10th—March 21st with 3 April 14th and 2 May 14th.

Rough-legged Buzzard: Exceptional numbers Jan. to May with one in June. Surprisingly only one autumn arrival (Cley Oct. 22nd): Recorded as follows (majority singles, but frequently 2 together): Barton Fen, Berney Arms, Breydon, Brettenham Heath, Cley, Dersingham Common, East Somerton, Ebridge (including June 1st), East Walton Common, East Tuddenham, Fleggburgh Common (till May 25th), Fritton, Foulden Common, Glandford, Halvergate, Haddiscoe, Heigham Holmes, Herringfleet, Hickling, Horsey, Holkham, Holme (including 9 May 13th), Kelling (till May 13th), Lynn Point, Lound, Massingham Heath, Overy Staithe, Ouse Mouth, Postwick, Ranworth, Reedham, Roydon Common, Sandringham, Salthouse (till May 18th), Sheringham, Snettisham, Smallburgh, Strumpshaw, Shotesham, Thetford, Tattersett, Wells (till May 13th), Weybourne, Winterton (3 in Feb., 4 in March, 5 April 22nd and 1—2 till May 19th), Witton, West Acre and Wolferton.

Red-footed Falcon

Osprey: Only six records: North: Cley April 21st and Sept. 7th, Blakeney Point Oct. 1st, Holme May 13th, Antingham Sept. 13th—27th and Narborough/Narford/Pentney Oct. 6th—11th.

Red-footed Falcon: East: Winterton male April 3rd (RC), females April 22nd, May 19th (PRA, ADB) and an immature Sept. 30th (PRA, ADB). North: Holme male June 8th (HBO), Kelling Heath immature female May 19th—23rd (GED, SJR *et al*).

Additional 1978 record: Cley immature male July 17th—27th (SCJ, ARL *et al*).

Merlin: Recorded at 31 localities up to May 12th and from Sept. 20th. Mainly singles, but 3—4 at Roydon Common.

Hobby: Singles at Acle, Breydon, Cley, Happisburgh, Hickling, Holme, Hethersett, Kelling, Letheringsett, Poringland, Sheringham, Syderstone Common, Titchwell, Welney, Winterton, Wiveton and Yarmouth. First May 8th; last Oct. 2nd.

Peregrine: North: Holkham/Thornham and Holme Sept. 27th; also at Holme Oct. 20th and 29th, Blakeney Jan. 29th, Scolt Head Oct. 20th, Hunstanton April 13th. East: St Olaves Feb. 10th. Fens: Wisbech SF infrequently through year (previously with jesses) and Welney Dec. 21st. Breck: Narford Dec. 26th. Wash Snettisham Nov. 5th.

Quail: North: Cley 1—2 regularly May 27th—June 24th and one caught with damaged wing on 15th. Heard Wells Aug. 30th—31st. Elsewhere, calling near Sparham June 6th and Tottington June 22nd.

Golden Pheasant: Recorded at East Harling, Thetford, Bircham, Flitcham, Sandringham—Wolferton, Swaffham Heath, Two Mile Bottom, Thompson and Narford.

Coot: North: Unusual observation of 82 on sea off Hunstanton Jan. 5th.

Crane: Broads: Geldeston April 5th/6th, Wortwell 20th/21st and Haddiscoe/Norton May 22nd/23rd doubtless all relate to same individual. Horning Oct. 7th bird captured (unable to feed as rubber wrapped round beak) and released March 1980.

East Norfolk: 2 Sept. 15th onwards and 3 Oct. 10th till end of year.

North: Holkham 2 March 17th. Cley May 23rd and 2 east March 17th. Fens: Welney May 22nd—26th.

Great Bustard: East: East Somerton male photographed Feb. 26th (JB) and later in day at Winterton (TC) and Martham (RGT). Bacton 2, possibly in from sea, March 2nd (RC). First county records since 1963.

Oystercatcher: Breeding pairs: East: Horsey Marshes 3. North: Blakeney Point 160, Scolt Head 170—180 and Brancaster golf course 7. Wash: Snettisham 12.

Avocet: North: Returned to Cley March 2nd and mating observed on 29th. Eight broods hatched from May 17th to July 10th with a total of 30 young. Last seen Nov. 3rd. Sheringham: 12 to east April 10th (compare Snettisham). Wash: Snettisham 12 April 10th and a single May 12th and June 1st. Broads: Hickling: April 15th, 3 May 9th (when mating noted), 2 June 10th—12th and singles Aug. 5th and Sept. 9th. East: Winterton 5 April 10th. Breydon: 3 March 17th, 2 April 10th (one till 15th), 1—4 on 10 dates between May 1st and June 13th and one Aug. 18th—19th.

Stone Curlew: Brecks: Breeding season records of 27—30 pairs.

Little Ringed Plover: Recorded from April 4th (W. Lexham) to Oct. 11th (Lyng). 17 pairs nested at 12 localities. Maximum counts of 7 at Cantley and King's Lynn Sept. 2nd and 12 west at Holme Aug. 2nd.

Kentish Plover: East: Breydon one June 7th and a different bird on 8th. North: Brancaster April 11th. Blakeney Point May 26th—30th. Cley—Salthouse 1—2 April 14th to June 4th often driven off by Ringed Plovers. Broads: Hickling: May 9th and June 13th—18th.

Dotterel: East: Winterton April 13th and Aug. 29th. North: Sheringham Sept. 7th.

Golden Plover: Large flocks: Welney 1200 May 6th, Lower Bure Marshes 1000 Jan. 7th and St Benet's Level 700 March 12th.

Grey Plover: Wash: Counts at Snettisham include 634 in Jan., 1100 May 27th, 940 Sept. 9th and 350 Dec.

Lapwing: Fens: 15,000 congregated at Welney early Dec.

Knot: North Titchwell 20,000 Sept. 7th, 35,000 Oct. 18th (a pure albino present Oct. 6th—10th), Holme 10,000 Oct. 5th and 12,000 on 10th. Wash: Snettisham: 28,560 in Jan., 27,500 late Sept. and 32,000 in Dec. Broads: Hardley Flood March 3rd.

Sanderling: North: Old Hunstanton 500 March 3rd, Thornham/Titchwell 100 June 3rd and 420 Sept. 9th. Wash: Snettisham 370 in July.

Little Stint: *Spring:* Cley March 20th, May 12th, 8 May 13th, 1—2 May 17th—29th, 10 June 10th and one on 23rd. Hickling: 2 May 12th. Fens: Wisbech SF June 8th. *Autumn:* Cley July 28th to Oct. 30th with maximum of 10 Oct. 7th. Weybourne 2 July 7th and 8 Oct. 6th. Broads: Hickling July 10th, 10 Sept. 23rd, 9 Oct. 2nd, 13 Oct. 10th, 3 Oct. 20th and 2 Nov. 2nd. Wisbech SF 2 Aug. 29th, 10 Sept. 26th—27th and 2—3 Sept. 29th to Oct. 27th.

Temminck's Stint: North: All records at Cley and Salthouse as follows: Cley during May: 2 on 17th, singles 18th, 19th, 21st, 22nd, 25th. June: one on 16th and 2 on 17th. Salthouse: 3 May 16th and one June 12th. Broads: Hickling 2 May 12th, 3 May 13th—16th, 2 May 18th—20th, 6 May 21st—22nd, 2 May 27th, singles May 28th, July 25th, Aug. 31st, Sept. 6th and 23rd.

White-rumped Sandpiper: East: Breydon Sept. 25th (PRA).

Pectoral Sandpiper: North: Cley Sept. 18th—25th. Burnham Overy Sept. 29th—30th. Broads: Hickling: Sept. 12th—26th.

Curlew Sandpiper: Three spring records: Cley May 26th, Weybourne June 2nd and Hickling June 23rd. In autumn Cley 100 Sept. 1st, Breydon 45 on 11th were the largest counts between July 17th and Oct. 31st. Small gatherings at Wissington BF and Holme.

Purple Sandpiper: Recorded from Gorleston, Yarmouth, Bacton, Mundesley, Overstrand, W. Runton, Sheringham, Cley, Brancaster, Titchwell, Holme Gore Point, Hunstanton and Heacham. Most observations in early part of year of 1—5 birds with maxima of 6 at Sheringham and Titchwell, 8 at Gore Point, 9 at Bacton and 9 at Hunstanton. In autumn from Aug. 12th (at Titchwell where 6 Sept. 27th and 3 Nov. 15th), Hunstanton 5 Nov. 17th onwards, Cley 3 Sept. 19th, Holme 2 Oct. 30th and W. Runton one Dec. 15th.

Ruff: East: Gorleston Jan. 27th. Broads: Hickling 30 May 14th and 45 on 15th. In autumn Wissington BF 36 Aug. 25th, Wisbech SF 21 Aug. 30th and Cley 20 Nov. 4th.

Snipe: Fens: 1050 at Welney in mid-March.

Woodcock: Roding at Cranwich, Witton, Winterton, Hickling, Horsford, Santon Downham, Weeting, East Wretham, Shouldham, Brundall, Catfield, Swaffham Heath and Mundford. Over 200 in Gillingham area in early Jan. when severe conditions tempted many into open.

Black-tailed Godwit: Breeding season: Fens: Welney 60 March 18th and impressive total of 122 (considered mostly Icelandic) April 18th; 5 pairs raised young. Cley: 2 pairs nested (young of one pair killed by Black-headed Gulls; female on other nest taken by Stoat). *Autumn:* Hickling 24 July 13th; Breydon 16 July 7th and 13th; Cley 10 Oct. 21st and 4 till Nov. 21st.

Bar-tailed Godwit: Wash: Snettisham 3700 in Jan. and 1847 in Sept. East: Breydon peak of 129 Sept. 27th.

Whimbrel: Extreme dates April 13th (Breydon) and Oct. 12th (Holme and Wells).

Curlew: Wash: Peak counts at Snettisham included 551 Jan., 1667 Sept. and 860 Dec.

Spotted Redshank: Winter records: Breydon Jan. 3rd; Cley Jan. 9th and Feb. 20th—25th, 2 Dec. 30th—31st. Autumn maxima: Cley 14 July 1st and 20 Aug. 24th, 18 Sept. 25th and 15 Oct. 21st—24th. Snettisham 50 during Aug. Inland: Lyng Easthaugh GP 2 Aug. 19th.

Redshank: Wash: Snettisham counts include 915 Jan., 921 Aug., 2,587 Sept. 3,006 Oct. and 1,500 Dec.

Marsh Sandpiper: North: Cley Aug. 14th—18th (DSF *et al).* The first county record.

Greenshank: In winter at Titchwell Feb. 25th, Dec. 8th and 29th. Spring largest party 9 at Hickling May 15th. Autumn maxima: Breydon 20 Aug. 1st, Titchwell 35 Sept. 9th, Holme 17 Aug. 17th—21st, Snettisham 42 July 13th and Scolt Head 18 Sept. 15th.

Green Sandpiper: Broads, largest party at Hickling where 19 Aug. 18th.

Wood Sandpiper: In spring 1—3 at Cley, Fleggburgh Common and Winterton May 7th—18th and one Wisbech SF June 13th. Autumn return from Aug. 7th including 8 at Cley.

Wilson's Phalarope: North: Cley May 17th—18th (RB, ISA). Holme Sept. 12th—20th (PRC, JN *et al*). Fens: Wisbech SF 2 Aug. 29th (SS, JL).

Red-necked Phalarope: North: Cley adult female May 13th—22nd, a male May 13th and 24th and another female June 17th—24th. Broads: Hickling May 14th. Autumn records from Cley Aug. 25th—Sept. 2nd, Weybourne Sept. 3rd, Sheringham Aug. 26th, Snettisham July 30th—Aug. 5th and Sept. 7th.

Grey Phalarope: North/East coasts: Hunstanton Jan. 4th, Winterton Sept. 23rd and Cley Dec. 21st are the only observations.

Pomarine Skua: East: Winterton Sept. 17th and Oct. 21st. North: Holkham Oct. 7th. Cley Sept. 22nd and 26th, 2 Oct. 15th, singles Oct. 16th, 18th and 27th. Walcott 4 Oct. 21st, Sheringham Feb. 18th, Sept. 21st, Oct. 2nd, Nov. 10th and Dec. 31st. Mundesley Nov. 20th. Blakeney Point Sept 7th. Hunstanton/Holme 4 Oct. 13th. Holme 3 Sept. 14th and 2 on 28th. Hunstanton Aug. 13th, 2 Aug. 27th and 3 Sept. 22nd. Additional 1978 records Holme 4 Oct. 21st, Snettisham Sept. 22nd.

Arctic Skua: In winter at Brancaster Jan. 1st, Blakeney Feb. 18th, Sheringham on 28th and Dec. 31st and Winterton Dec. 1st. Autumn totals include: Hunstanton 30 Aug. 24th, Holme 42 Aug. 27th and 40 Sept. 19th and Titchwell 35 Sept. 3rd. Biggest counts Sept. 22nd when 27 at Sheringham, 37 at Cley and 130 at Hunstanton.

Long-tailed Skua: East: Winterton Aug. 25th (PRA). North: Blakeney Point immature Aug. 26th (DP), Holme adult Sept. 22nd (RM, BAC).

Additional 1978 records: Sheringham 2 juveniles Sept. 17th (CIB, DSF) and Scolt Head 3 juveniles Aug. 27th (SCJ, NW).

Great Skua: Early in year records from Sheringham Jan. 1st and 4th (latter bird dead), Feb. 16th and 18th; Hunstanton Jan. 1st and 3rd, Bacton Feb. 18th and Yarmouth Feb. 18th.Maxima in autumn: East: Winterton 9 Sept. 21st. North: Cley 13 Aug. 26th, 20 Sept. 22nd; Sheringham 15 Sept. 22nd; Titchwell 18 Sept. 21st; Holme 40 Sept. 15th, 12 on 19th and 11 on 22nd; Hunstanton 17 Sept.22nd and Brancaster 13 Sept. 22nd. Latest Mundesley 4 Dec. 21st and Hunstanton Dec. 31st.

Mediterranean Gull: East: Yarmouth May 25th, 29th, Sept. 29th and Oct. 31st. Breydon at least 8 first-summer birds May 9th to June 26th with 5 together May 27th. Horsey adult Jan. 13th. North: Cley a first-summer bird April 16th—17th and another June 2nd and Oct. 6th. Sheringham April 13th—May 5th, Oct. 1st—2nd and Dec. 20th. Wells Sept. 27th. Burnham Deepdale Aug. 27th, Scolt Head July 26th and Old Hunstanton immature Jan. 6th. Wash: Snettisham June 16th—17th.

Little Gull: Many records of small parties for each month except Dec. from Yarmouth, Gorleston, Walcott, Happisburgh, Hickling, Winterton, Cley, Sheringham, Holt (2 over town centre Aug. 11th), Filby, Weybourne, Wells, Holkham, Brancaster, Titchwell, Hunstanton, Heacham, Snettisham and Ouse Washes. At Holme-Thornham up to 25 immatures and 4 adults present during June. Largest numbers moving during Sept:—Oct. as follows: Winterton 92 to north Sept. 16th. Pronounced movements Oct. 26th to east with Sheringham 100, Cley 40, Walcott 145, Holme/Hunstanton 87 and again Oct. 27th with Sheringham 219, Cley 115, Happisburgh 100, Winterton 185 (in 3½ hours), Holme 78, Titchwell 20, Hunstanton 60 and Heacham 10. Lesser numbers Oct. 23rd when 40 off Sheringham and 46 (including 18 inland) at Walcott and Oct 28th when Holme had 39 east.

Sabine's Gull: *Spring:* Happisburgh immature April 27th, Holme adult May 17th and a second-summer bird June 22nd and Cley May 18th.

Other records from Winterton where immature Sept. 23rd, Cley Oct. 22nd and an immature Dec. 22nd, Holme immature Aug. 29th and an adult Oct. 6th.

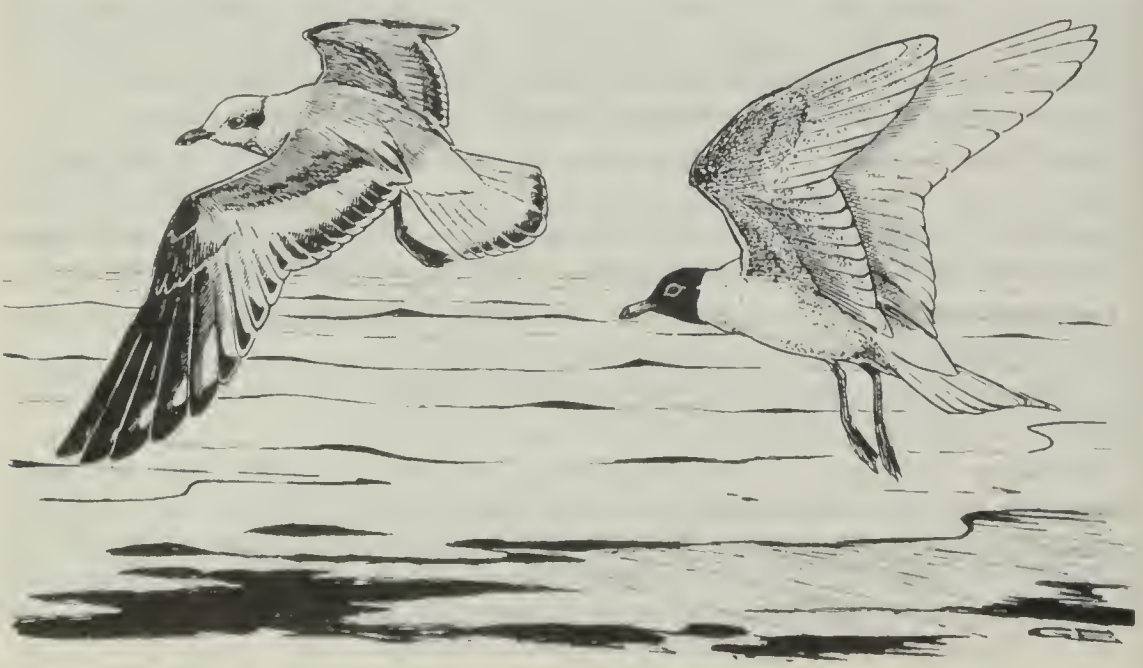
Common Gull: North: A pair bred at Blakeney Point raising 2 chicks.

Lesser Black-backed Gull: North: Blakeney Point 2 pairs nested, but only one hatched 2 young.

Iceland Gull: East: Breydon Nov. 25th. North: Sheringham Dec. 14th; Holme second winter Feb. 18th and immature May 29th.

Glaucous Gull: The now familiar Blakeney to Sheringham adult present until March 10th and from Aug. 19th; another adult was present during winter. Also records from Breydon (2 Feb. 25th), Heacham (2 Jan. 6th), Holkham, Sea Palling, Holme, Strump-

Mediterranean Gulls.



Shaw, Caister, Waxham, Overstrand, Mundesley, Cromer, Snettisham, Brancaster and 5 between Hunstanton and Thornham March 17th. Seen up to April 29th and from Oct. 28th. Unusual summer record from Blakeney: July 3rd.

Kittiwake: 12—15 pairs attempted nesting on gas rig 45 miles NE Yarmouth — all unsuccessful.

Sandwich Tern: North: Blakeney Point 3,500—3,800 nesting pairs raised 2,000 flying young. Scolt Head 2,000 pairs raised 1,500—1,600 flying young. Inland: 2 at Gillingham on Waveney July 15th and 4 Wisbech SF Sept. 9th. Late birds at Holme Oct. 31st and off Cley and Sheringham Dec. 23rd.

Roseate Tern: North: Blakeney Point May 17th (PAG) and Sept. 5th (MC).

Common Tern: Observed April 13th (Flegg Broads) to Oct. 17th (Titchwell). Breeding pairs (young raised in brackets): Broads: Hardley Flood 16 (20), Ormesby 6, Ranworth 27 (58), Hickling 13 and Martham 3 (6). East: Breydon 31 (33).

North: Salthouse 10 (1), Overy Staithe 5, Thornham 2, Titchwell 9, Scolt Head 300 (110), Blakeney Point 850 (500), Cley 2, Bob Halls Sands 74, Stiffkey Binks 104. Wash: Snettisham 120 (120). Central: Lyng Easthaugh GP 4 (5).

Arctic Tern: North: Blakeney Point 3 pairs raised 3 young to flying stage, Stiffkey Binks 2 pairs bred and Scolt Head one pair bred.

Little Tern: Extreme dates April 12th (Thornham) to Oct. 17th (Wells). Breeding pairs (numbers of young in brackets): East: Winterton/Waxham 17—18 pairs (some young trodden by horses). Broads: Hickling 34. North: Blakeney Point 160—180 (160), Thornham 30—35 (35), Brancaster 19 (25—30), Burnham Overy/Wells 49, Titchwell 33, Scolt Head 71 (83), Stiffkey Freshes 20—25, Bob Halls Sands 17, Stiffkey Binks 38.

At Hickling Broad roost at peak May 11th—16th when up to 126 assembled.

Black Tern: A widespread spring passage began April 11th when one at Cley and 2 at Welney; Sea Palling on 12th and Snettisham on 15th. A considerable movement was evident May 13th/14th as follows:

May 13th: Ranworth 25, Hickling 41, Breydon7, Hardley Flood 2, Lyng Easthaugh GP 2, Micklemere 2, Welney 32, Sea Mere 3 and a single at Cley.

May 14th: Lyng Easthaugh GP 3, Hickling 20 and 20 there on 23rd. Three birds at Hoveton Great Broad May 15th summered until departure Aug. 14th — the first oversummering record for Broadland since breeding ceased in last century. Autumn passage from July 1st (Snettisham) and 7th (Wisbech SF) and among Aug. records Overy Staithe 15 on 17th, Cley 28 on 18th, Holme 24 on 17th and 21 on 18th, Terrington 5 on 18th, Hunstanton 12 on 15th and Sheringham 10 on 19th. Sept. records from Cley (including 10 on 2nd and 22 on 8th), Blakeney, Snettisham, Sheringham and last seen Scolt Head on 26th.

Black Guillemot: East: Paston Aug. 20th. North: Cley Dec. 22nd—31st.

Little Auk: North: Cley Nov. 13th (oiled) and Dec 16th, Weybourne Dec. 24th (dead), Kelling Dec. 20th (exhausted), Sheringham Dec. 26th (dead). East Winterton Oct. 27th, Horsey (exhausted a mile inland) late Jan.

Puffin: North/East coasts: 1—4 on 11 dates in May and Sept.—Nov.

Collared Dove: Interesting series of spring migrant records: Winterton several north April 21st/22nd, 5 north on 29th, 7 May 5th, 4 north on 12th and 4 north on 19th with one in from sea 18th; 2 on gas platform 55 miles NE of Yarmouth May 15th, one on platform same date 45 miles NE of Yarmouth; also 2 with 2 Turtle Doves on gas platform 55 miles NE of Yarmouth June 29th (PRA). Sheringham, passage of 26 west May 7th.

Turtle Dove: North: Spring westerly movement included 500 Weybourne May 15th, 235 Brancaster May 14th with 288 on 15th and 90 June 6th; 150 an hour Cley May 31st.

Ring-necked Parakeet: Singles at Winterton, Sheringham and Holme with 2 at Hickling.

Barn Owl: Recorded at 80 localities. One of dark-breasted race at Holme Oct. 26th (TRB).

Little Owl: Recorded at 33 localities.

Tawny Owl: A grey-phase bird Hardingham Sept. 20th (JDG).

Long-eared Owl: Only one known breeding record: Grime's Graves in Breck. Breeding season records from Salthouse Heath, Brancaster Common and Hindolveston. Spring migrants at Waxham April 8th, Cley (Walsey Hills) on 11th and Winterton (3-4) next day. Wintering birds at Winterton, East Ruston, Cley, Massingham Heath, Salthouse Heath, East Wretham, Snettisham, Brancaster Common (7 Jan.—Feb. and 6 Nov.) and Ringstead Common (3 Dec).

Migrants in off Sea at Walcott (Oct 24th) and at Sheringham and Cley (Oct. 27th). One on a gas production platform 45 miles NE of Yarmouth April 18th. A severe weather casualty Wacton Feb. 16th.

Short-eared Owl: Breeding season records from Cley, Salthouse, Weybourne, Sheringham, Cantley, Tunstall, Belton, Burgh Castle, Acle Marshes and Hickling. Winter roosts: Runhall 8 Jan. 28th and Acle Marshes 10 Feb. 17th. Spring migrant to sea at Happisburgh May 10th.

Migrants in off sea at Sheringham Jan. 13th, Happisburgh Oct. 11th, Cley Oct. 24th and Blakeney Point Oct. 27th.

Nightjar: Breeding: Brecks: Records received from Mundford, East Wretham, Santon Downham and Grimes Graves but undoubtedly present at other suitable locations. Elsewhere noted at Sandringham/Wolferton/West Newton, Shouldham, Roydon Common, Swaffham Common, Leziate (5 pairs), Salthouse Heath (5 + singing males), Horsford and Winterton.

Swift: Only four October records received, all early in the month. A very late bird at Happisburgh Nov. 5th.

Alpine Swift: One moving westwards Weybourne May 13th (KB). First since 1975.

Kingfisher: An unusual record of one flying along beach at Bacton Nov. 7th. Recorded at 67 localities.

Hoopoe: A total of seven spring records: Caister March 26th—28th, Holme April 16th—18th, Crostwick Heath April 16th, near Ridlington April 17th, Bramerton Woods End May 8th, Stibbard May 20th and Gooderstone May 29th. As in 1978 a single autumn record: Holkham Park Aug. 1st.

Wryneck: In spring four records within an eight-day period in May: East Wretham on 6th, Narborough on 10th, Hickling on 12th and Cley on 14th. An unusual record of one at Anmer June 18th. In autumn only recorded within two narrowly defined periods at end of August and beginning of October as follows: Cley and Hickling Aug. 25th, Blakeney Point Aug. 27th, Hunstanton Aug. 29th—31st, Wells (2) Oct. 2nd, Stiffkey Oct. 3rd and Gorleston Oct. 3rd—6th.

Short-toed Lark: A further three autumn records, all separate individuals in the Weybourne area Sept. 25th/26th (GED, MF, KBS, MPT), Oct. 16th (GSM, JCM) and Oct. 20th (MF).

Woodlark: Suprisingly no records received away from Brecks where only noted at four localities. Most regularly in the Santon Downham area including 15 Sept. 1st.

Skylark: A pale grey bird at Sheringham Sept. 25th/26th considered to be one of the Eastern races (KBS).

Shorelark: Only regularly recorded Cley-Weybourne area where present up to May 14th (2 at Kelling Quags) and from Oct. 27th with maximum of 43 at Salthouse Jan. 9th. Elsewhere on North Coast. Holme 6 Oct. 5th/6th, 2 Oct. 10th and one Oct. 28th, Scolt Head 3 Oct. 12th, 2 Oct. 20th and 3 Oct. 23rd, Holkham 40 Feb. 4th and one Nov. 17th, Wells 15 in Dec. and Blakeney Point 12 Feb. 18th. Only one East coast record: Gorleston Oct. 6th.

Sand Martin: Two late autumn migrants, Weybourne Oct. 15th and West Acre Oct. 24th.

Swallow: First spring record at Stiffkey March 27th. An albino Stalham Aug. 29th. A late bird at Wells Dec. 2nd.

Red-rumped Swallow: North: Holme June 3rd and presumably the same bird briefly the next day (HBO). The second in three years but only the fourth county record.

House Martin: A large breeding colony containing 136 nests still present on Saddlebow Bridge near King's Lynn. A total of eight records of 1—5 birds still present in November. Also the first December records for 5 years with singles at Mundford on 2nd and Yarmouth on 6th.

Richard's Pipit: Four autumn records: Weybourne Sept. 29th (KH, TAW), Holme Oct. 1st—26th (HBO), a second at Weybourne/Sheringham Oct. 13th (MPT, TAW *et al)* and Horsey Nov. 24th—28th (PRA, TEB, RC). A wintering bird at Cley Dec. 21st into 1980 (PAD *et al*) following one at Holme in 1977 - 8 winter.

Tawny Pipit: East: Winterton April 22nd (PRA, ADB, SC) and June 5th (RC, MF).

Rock Pipit: One showing characteristics of Scandinavian race at Sheringham April 13th.

Water Pipit: At Cley singles Jan. 7th and four dates Oct. 17th—Nov.17th. At Hickling 2 April 11th, one April 14th—16th, 2 Oct. 24th one remaining until Nov. 5th. Elsewhere Blakeney Point Oct. 12th and Winterton Oct. 28th and Nov. 24th.

Yellow Wagtail: Fens: 70 Wisbech SF April 20th. An interesting record of an autumn roost at Stow Bridge with 200 Aug. 10th—25th dropping to 50 by end of month and dispersing soon after.

Blue-headed wagtail: Following isolated records of 1/2 birds in April, the first being at Wisbech SF on 13th, an above-average number of records in May (perhaps as many as 47) at a variety of localities with maxima of 8 at Happisburgh May 7th, 6 at Sheringham May 8th and 12 at Winterton May 9th. Singles at Breydon June 24th and July 2nd.

Kirghiz Steppe Wagtail: A male showing characteristics of this race Sheringham April 15th (DS, KBS). The first county record of this race.

Grey-headed Wagtail: Singles at Cley May 16th and 22nd, Salthouse May 28th and Hickling June 1st—6th.

Ashy-headed Wagtail: A male showing the characteristics of this race at Winterton May 19th (PRA, ADB). The sixth county record of this race and recorded for the third year in succession.

Grey Wagtail: Breeding only noted at Keswick Mill and along River Nar (two successful nests). Also present in Norwich in summer months but no proof of breeding.

Pied Wagtail: Fens: An interesting roost at Stow Bridge late July—early Sept. with maximum of 500 Aug.10th.

Waxwing: Again only a small number of records: Stalham Jan. 3rd, Thorpe St Andrew Jan. 5th, Stoke Holy Cross Jan. 14th, Strumpshaw (3) Jan. 20th—21st, Norwich Jan. 28th, Gorleston Feb. 8th, Waxham Nov. 21st—24th and Wells Dec. 25th.

Alpine Accentor: Attention has been drawn to a record of one under the old Gorleston Pier 21st Sept. 1894 observed by A. H. Patterson and published in *The Handbook*. Hence the Sheringham 1978 observation is second county record.

Nightingale: Only one passage migrant noted, Happisburgh (ringed) May 9th.

Bluethroat: Singles at Happisburgh (ringed) May 9th and Weybourne Sept. 25th. This species appears to be becoming an increasingly rare passage migrant, especially in autumn.

Black Redstart: Breeding season: Yarmouth 6 singing males. Elsewhere a pair at Weybourne until mid-June but no evidence of breeding and one Norwich mid-May. Main spring passage March 19th—April 24th with maximum of 6 at Winterton April 10th. Isolated records at Snettisham May 7th and Sheringham May 17th. In autumn isolated records at Gorleston Sept. 6th and 10th (probably relating to dispersing breeding birds from Yarmouth) with main passage Sept. 30th—Oct. 16th. No winter records received.

Redstart: Breeding season records from Frog Hill, Foulden, Sheringham (2 successful pairs), Felbrigg and Horsford. Late migrants at Wells Oct. 28th and Happisburgh Oct. 31st.

Whinchat: Present in summer months at Bridgham Heath and Winterton, but no proof of breeding.

Stonechat: Breeding: One pair at Weybourne and five pairs Winterton-Horsey.

Wheatear: A major influx of migrants on Wash and North coasts April 10th. Apart from Brecks breeding noted at Snettisham and Leziate. November migrants at Happisburgh on 1st, Wells on 3rd/4th and Snettisham on 4th and 24th.

Ring Ouzel: Spring passage March 24th—May 14th with maxima of 5 Winterton April 13th, 7 Potter Heigham April 21st (an unusual number inland) and 8 Weybourne May 8th. A late female Blakeney Point June 2nd. Autumn passage commenced Sept. 30th, with simultaneous arrival at five north coast localities, and continued until Nov. 13th when a late bird at Hickling; maximum concentration 17 Wells/Holkham Oct. 13th.

Fieldfare: Latest spring records, Winterton May 16th and Buckenham May 21st.

Cetti's Warbler: Broads: Spring singing males in Yare Valley at Surlingham (4), Wheatfen (5), Strumpshaw (9) and Rockland (3). The cold weather early in the year appeared to have little or no effect on this species and having regard to the similar numbers recorded since 1976 it is interesting to speculate whether it has reached its optimum population level in this particular area of specialised habitat in the Yare Valley. Only one record elsewhere, one singing at St Olaves end December.

Pallas's Grasshopper Warbler: 1976 record: North: Cley Sept. 13th (GS). The first county record of this vagrant which breeds in Western Siberia and central Asia and only the fourth British record.

Savi's Warbler: Broads: Hickling: First April 13th singing regularly until May 5th when joined by a second songster. Four in song from mid-May until early June with occasional outbursts until end of July. Singing resumed from Aug. 1st and last heard Aug. 18th. Martham Broad at least 2 singing males (3 birds seen). Horsey Mere one pair present. Elsewhere one singing Cley April 24th—28th.

Icterine Warbler: Only a small number of records as in 1978: Wells Aug. 25th—27th, Sheringham, (trapped) Aug. 28th, Gorleston Sept. 14th and 23rd, and Yarmouth Oct. 1st.

Barred Warbler: North: Cley Aug. 24th—27th, Blakeney Point Oct. 13th, Wells 2 Aug. 26th/27th one remaining until Sept. 1st and another Sept. 9th, Holme 3 Aug. 25th and singles Aug. 29th & 31st and Hunstanton 2 Aug. 29th—31st.

Garden Warbler: A late migrant ringed at Happisburgh Nov. 2nd.

Blackcap: Wintering records: birds regularly seen in first winter period at Thetford, Poringland (2) and Hellesdon. Elsewhere isolated records at Edgefield Green Jan. 6th, Bacton: Oct. 1st and Yarmouth Oct. 2nd.

Yellow-browed Warbler: North: Wells/Holkham 1—2 Sept. 30th—Oct. 13th including one on the 3rd which called 57 times in succession, Blakeney Point Oct. 1st. East: Bacton: Oct. 1st and Yarmouth Oct. 2nd.

Wood Warbler: First recorded April 15th at Narborough. Coastal spring migrants at Wells and Snettisham May 13th and Titchwell May 15th. Singing males in breeding season at Sheringham (2), Kelling (2), South Runcton, Swaffham Heath and at one Breck locality. One at Leziate July 4th. Autumn migrants at Wells Aug. 27th, Blakeney Point Aug. 9th & 31st and Beeston Regis also on 31st.

Chiffchaff: Birds of *abietinus* race at Yarmouth Oct. 1st and Wells Oct. 24th. A wintering bird at Narborough Dec. 21st until end of year.

Willow Warbler: Birds of greyer Northern race noted Cley May 7th (6) and Holme May 13th (30).

Firecrest: Spring migration occurred in three distinct periods: March 27th—April 2nd, April 8th—22nd and May 5th—16th. At least 30 birds involved, most in mid April, with records from Holme, Titchwell Holkham/Wells, Blakeney Point, Cley, Sheringham, Waxham, Winterton, Hopton and Gorleston, and inland at West Walton, Witton, Bodham, Felbrigg and Taverham. Maximum daily count of 3 at Holme and Holkham/Wells. Total of at least 15 in autumn between Oct. 2nd—Nov. 8th with records from Holme, Holkham/Wells, Sheringham, Happisburgh, Yarmouth (where maximum of 4 Oct. 5th), Gorleston and inland at East Wretham and Blickling. One found dead Coltishall Dec. 2nd.

Spotted Flycatcher: A pair in an East Tuddenham garden September 6th—8th seen to catch Small Tortoiseshells, Peacock, large White, Brimstone and Silver moth.

Red-breasted Flycatcher: One spring record, a female or immature male Blakeney Point June 4th (JBK), the first since 1972. In autumn Cley Oct. 1st (JBK), Yarmouth

Firecrest and Goldcrests.

Oct. 1st/2nd (PRA, GED) and Holme Oct. 27th (HBO). An exhausted bird found on a gas production platform 45 miles north-east of Yarmouth Oct. 2nd released at Caister the same day (PRA).

Pied Flycatcher: Only small number of spring migrants: Wells/Holkham April 27th and May 13th, St Olaves May 9th and Waxham May 11th.

Bearded Tit: Concentrations include 35 Salthouse Jan. 9th, two parties totalling 60 St Olaves/Haddiscoe area Jan. 14th and 50 Strumpshaw Nov./Dec. None bred at St Olaves where regularly did so prior to 1978/9 winter, and only one breeding pair at Horsey.

Golden Oriole: Male singing Wiveton May 26th (MF, MPL, MPT), male Martham Ferry May 29th (BAB), two near Lakenheath May 29th (DJH) and a female Hickling June 4th (SEL). Three also present at a north Norfolk locality early June, but no evidence of breeding.

Red-backed Shrike: Spring migrants at Weybourne June 10th and Holkham next day. Breeding: Details of only 6 pairs received but Breck records incomplete. Total of over 20 autumn passage migrants at coastal localities Aug. 21st—Oct. 13th including 2 Winterton Aug. 30th and 3 Holme Sept. 1st—3rd.

Lesser Grey Shrike: Wash: One in Ringstead area July 22nd—Sept. 3rd. (HRR *et al*).

Great Grey Shrike: During first few weeks of year noted at Stiffkey, Cley, Salthouse, Beeston and Roydon Commons. Following cold weather in February only one record, Bridgham Heath March 3rd, until departing birds appeared end March at Wiveton and Salthouse Heath and April 10th at Winterton and April 14th at Strumpshaw. Autumn arrival Sept. 30th/Oct. 2nd with birds at Sheringham, Happisburgh, Winterton and Yarmouth followed by records from Cley, Strumpshaw and Roydon Common in second winter period.

Nutcracker: 1978 record: Gunton Oct. 6th (IWC).

Hooded Crow: Recorded up to May 9th and from Oct. 24th, but majority of records refer to 1—2 birds, continuing the scarcity of this species noted in 1978. Maximum number 5 Winterton April 13th.

Following a freeze-up in the Baltic, Sawbills became a feature of the opening months of 1979 both inland and in coastal waters. As many as 56 Goosanders (centre) assembled at Downham Market with 150 - 200 Red-breasted Mergansers (top and bottom) off Heacham. Some lingered until mid-April. *Photos: Pamela Harrison.*

Rose-coloured Starling: North: near Salthouse Heath and later Cley village May 19th—27th (many observers).

Brambling: North: male singing continuously Salthouse Heath June 17th—25th.

Serin: North: Additional 1977 record: female Wells May 1st (SCJ, NW).

Siskin: Breeding confirmed at Wells and also suspected near Santon Downham. Flocks include 50 wintering in St Olaves area, 30 Langford Hall (Battle Area), 60—80 Lyng Easthaugh in Nov. and 30 Lound in Dec.

Twite: Coastal flocks included 300 Titchwell Jan./Feb. and 500 Blakeney Point Oct. Two late birds at Cley May 6th. Inland at Hickling on Feb. 12th (18), Feb. 21st (30) and Oct. 10th (15).

Mealy Redpoll: Only one record received: 4 Winterton Oct. 28th.

Crossbill: Regularly recorded throughout the year in Breck (successful breeding noted at Cockley Cley, Gooderstone and Swaffham Forest), Sandringham area and St Olaves, and also in second half of year at Wells/Holkham. Elsewhere 4 Hickling March 25th and one Winterton Aug. 29th/30th.

Scarlet Rosefinch: North: Immature male in song Holme June 4th (HBO). The fifth county record.

Hawfinch: Breck: Records from Hilborough, Gooderstone, Methwold (2 flying young seen), West Acre, Foulden, Cockley Cley, Thetford, Swaffham Heath, St Helen's Well, Santon Downham, Brandon and East Wretham, where maximum of 25—30 Dec. 11th. Elswhere Brancaster Jan. 7th, 3 Reedham Feb. 19th, 2 Holkham April 15th and 4 Oct. 20th, 2 Salthouse Heath April 21st, at least 6, including a large juvenile being fed Ringstead Downs early July, Pilling Park, Norwich Aug. 28th and 12 Roydon Common Dec. 12th.

White-throated Sparrow: 1968/9 record: It has recently been ascertained that the bird reported at Lowestoft from Nov. 16th 1968 until 1st Jan. 1969 was in fact seen, and later died, at St Olaves and hence is a belated addition to the county list.

Lapland Bunting: North: Only singles reported in Jan. at Morston and Holkham. Many more records from Sept. 23rd onwards Sheringham—Holme with maxima of 9 Titchwell and 13 Sheringham 23rd—25th Oct. North-east: 4 Paston Oct. 15th/16th and 7 Oct. 29th. East: Breydon 9 Jan. 3rd, 6 Jan. 24th and one March 30th, Halvergate present Jan./Feb. with maximum of 31 Jan. 14th, Winterton Sept. 16th, 20 south 29th, 12 south 30th, peaks of 6 in Oct. on 14th and 20th with last 3 Nov. 8th.

Snow Bunting: A late spring male Hunstanton May 5th and another at Winterton on the exceptional date of June 15th. Largest concentrations in second winter period with maxima of 350 Blakeney Point Dec. 9th and 200 Cley Dec. 24th. Inland: 95 Halvergate Feb. 25th and singles West Acre Nov. 12th—16th and R. Nene, West Walton Dec. 25th.

Opposite page:
Ideal beaver habitat is shown at the top of the page: aquatic and emergent plants, shrubs and trees and open water. Hutwilersee, Switzerland. The beaver dam was in Brittany. The river was much reduced in flow in the drought of 1976. The beavers built a dam which fell into disuse when water levels returned to normal. *Photos by Nick Pinder.*

The fine picture of a beaver, below, is contibuted by "Wildlife Studies".

Ortolan Bunting: North: Holme Aug. 25th (HBO).

Black-headed Bunting: North: Cley male April 30th—May 3rd GJW *et al*). The first county record.

The following, not mentioned in the Classified Notes, were also recorded in 1979 (breeding species in italics): *Mute Swan, Canada Goose, Mallard, Kestrel, Red-legged Partridge, Grey Partridge, Pheasant, Water Rail, Moorhen, Ringed Plover,* Dunlin, Jack Snipe, Common Sandpiper, Turnstone, *Black-headed Gull,* Herring Gull, Great Black-backed Gull, Guillemot, Razorbill, *Stock Dove, Woodpigeon, Cuckoo, Green Woodpecker, Great Spotted Woodpecker, Lesser Spotted Woodpecker, Treè Pipit, Meadow Pipit, Wren, Dunnock, Robin, Blackbird, Song Thrush,* Redwing, *Mistle Thrush, Grasshopper Warbler, Sedge Warbler, Reed Warbler, Lesser Whitethroat, Whitethroat, Goldcrest, Long-tailed Tit, Marsh Tit, Willow Tit, Coal Tit, Blue Tit, Great Tit, Nuthatch, Treecreeper, Jay, Magpie, Jackdaw, Rook, Carrion Crow, Starling, House Sparrow, Tree Sparrow, Chaffinch, Greenfinch, Goldfinch, Linnet, Redpoll, Bullfinch, Yellowhammer, Reed Bunting* and *Corn Bunting.*

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NORFOLK MAMMAL REPORT 1979

Editorial

The Editor is pleased to present the 24th Norfolk Mammal Report

Readers of the 1978 Report may have been surprised to be asked to submit contributions for the 1979 Report by the end of January 1979. More serious was the transfer of the town of Aylsham from its rightful position on the Norwich to Cromer road onto the B1149 between Holt and Norwich. The Editor apologises to the contributor concerned and to all members for these errors.

Our main article this year is by Nick Pinder who has spent some years in a serious study of the history of beavers in this country, their present status in Europe and the results of attempts to reintroduce them into seemingly favourable surroundings. In view of the recent publicity given to the possibility of reintroductions into parts of the British Isles, including East Anglia, it seems an opportune time to give members the benefit of his expertise. The article is illustrated by photographs from his portfolio on European beaver habitat.

One of the most astonishing photographs of a mammal seen for some time was submitted by Rod Powley and very regrettably it is not possible to reproduce it in this Report. Rod is a keen photographer of birds and erected his hide to photograph a pair of Reed Buntings feeding their young at the nest. The nest was very low and as he was setting up his camera he noticed a shrew waiting in cover and repeatedly darting out to take food from the youngster's throat when the adult had flown away and before the young bird had closed its beak. Fortunately he was able to photograph a further repetition of the incident. We are also indebted to this versatile naturalist for the new line drawings illustrating this Report.

The Editor thanks all who have sent in contributions. It is not possible to acknowledge them individually but all, however brief, are most welcome. Without the help and active encouragement of our contributors there would, of course, be no Report. Mention must be made too of the specialists who have continued, with great patience and kindness, to give their time and assistance. They include Dr I. Keymer, Veterinary Investigation Centre, Dr L. M. Gosling, Coypu Research Laboratories, Arthur Woodhams, Pest Control Officer, MAFF, Rex Whitta, Wildlife Ranger, Forestry Commission District Office, Santon Dowham and John Goldsmith, National History Department, Castle Museum, Norwich. John continues to deal with all queries regarding vertebrates addressed to him at the Castle Museum, Norwich NR1 3JU. Tel. Norwich 22233 ext. 649.

Notes for the 1980 edition of the Norfolk Mammal Report should be sent *by the end of January 1981* to R. C. Hancy, 124 Fakenham Road, Taverham, Norwich, NR8 6QH. Tel. Norwich 860042. Members are assured that they need not feel restricted to this one, formal, submission. The Editor is always pleased to hear interesting accounts and to discuss mammal topics at any time during the year.

Beavers in Norfolk, their past and possible future

by Nick Pinder

THE BEAVER is familiar to all except the most parochial naturalist but the popular picture of a skilful lumberjack and clever builder is slightly wide of the mark. Decades of study are only now revealing the more prosaic, but perhaps more interesting, truth. It is important that this truth is understood by those with an interest in the countryside bacause, whatever the merits or demerits of the recent proposal to reintroduce the beaver to Britain, the proposal must be judged on scientific facts and not on opinions gleaned from the Walt Disney world of popular television and books.

At present there is no proposal to reintroduce the beaver to Norfolk, although in view of its history in this country there is sufficiently close an association to make the idea attractive. The recent identification of a pair of beaver jawbones in material taken from a 12th Century context in the excavations at Castle Acre gives Norfolk the honour of having the most recent remains in the country. Perhaps too much should not be read into the Castle Acre material, which has yet to be fully studied, for although the site is adjacent to what would, in Norman times, have been excellent habitat, the valley of the River Nar, animals could perhaps have been brought from France for festive purposes.

Beavers would certainly have been very scarce by this date as they have been intensively hunted since the dawn of history, so much so that in Denmark they became extinct in the Bronze Age, circa 1000 BC. They were hunted for their fur, of course, but also in these early days for their teeth which made fine cutting edges for tools. Beavers have been recognised since Roman times as providing amongst the most desirable of all pelts on account of the dense, soft and waterproof underfur. They were also important for their castoreum, a scent secretion largely composed of salicyclic acid and other aromatic compounds. These do, in fact, confer some medicinal properties so some of the many remedies using castoreum cited by Pliny, for instance, have some scientific basis. Even in these early times, over-exploitation of the beaver occurred however and the demand for castoreum exterminated the beaver in the Danube delta.

By early medieval times, the importance of the beaver in commerce was well established and inspired exploration of first the Arctic coast of Russia and then the interior North American wilderness. The potential revenue from furs, especially that of the beaver, fuelled the race to explore Canada and several financial empires, including the Hudson Bay Company, were based on its exploitation. However, while France and England were warring over who was to control the lucrative fur trade, the beaver was gradually disappearing from its familiar haunts in lowland central Europe. In the 19th Century the all too familiar story of protection coming too late was destined to be played out in the case of the bearer. One year after its extermination in Sweden, for example, a law was passed giving it complete protection, while in Norway numbers were reduced to less than a hundred before a protective law was brought into force. As far as can be told from this distance in time, the turn of this century saw the lowest ever numbers of European beavers, something under 1500 animals in total at three localities in western Europe (the rivers Nid in Norway, Elbe in Prussia and Rhone in France) and eight localities, we now know, in Russia.

The result of over-exploitation of the North American beaver did not become apparent until the Thirties when Grey Owl began his campaign for their protection.

By then, however, several European countries had taken active steps to conserve the beaver. Russia had instituted a system of beaver farms and reserves and was actively engaged on restocking projects. France and Norway had passed protection laws and the latter country had supplied a few animals for reintroduction projects in both Sweden and Finland. The Finns also released seven Canadian beavers. Forty years later, in 1975, Canadian beavers comprised over 95% of the total population of some 4—6,000 individuals. The reason for the success of the North American species is unclear, although they do tend to have larger litters. However it is now known that they are separate species and earlier fears that they were interbreeding in those parts of their range where they co-exist would appear to be unfounded. Nevertheless, the success of the North American at the apparent expense of the European species is causing considerable worry in Scandinavia.

The differences between the two species are important since judgement of the feasibility of the reintroduction project must be based as far as possible on European data.It is invalid to assume that because the two species are so similar in appearance that their ecology is also similar permitting data to be used interchangeably without qualification. For not only is the North American species more prolific but its habits appear to differ in significant ways too. The classic mental picture of a beaver-dam, pond and lodge on a sparkling trout-filled brook set in magnificent conifer-filled scenery is almost mythological and certainly misleading. These pictures, deriving from North America, are used mainly because they are so spectacular and of course it is easier for us to read the American books and magazines in preference to the foreign language of our closer continental neighbours.

European beavers do build dams, of course, but far less frequently than one might imagine. For example, considerable excitement was created amongst the French wildlife fraternity in the 1950's when it was found that their beavers did occasionally build dams. They build lodges less frequently also, preferring wherever possible to excavate burrows in the banks of the river or lake. This behaviour has been extensively studied, in the wild in Russia for example, and in captivity in France. It appears in fact that burrow-digging is the ancestral behaviour, lodge-building having evolved from this behaviour over the millenia through the intermediary action of covering up the holes appearing at ground level resulting from the collapse of tunnel roofs.

It is now clear that dam-building is, in common with other aspects of behaviour, merely a response to a given stimulus. In this case the stimulus is an increase in the sound made by flowing water, indicating that the water level is falling. The response is to build a dam at the spot where the noise is loudest, that is where the water is shallowest, and although the dams are skilfully executed, waterproof constructions there is no true application of hydrological principals. The end result is a ponded-back reach of river giving security to the underwater entrance of the lodge or burrow and permitting the builder to swim safely rather than walk dangerously to the further end of his territory. This is successful often despite, rather than because of, the beaver's activities and superfluous dams are often repaired first in preference to those more responsible for holding water.

Tree-felling, too, is a rather haphazard activity although this important aspect of beaver behaviour remains to be properly studied. Despite the range of species that may be felled at any one site, and which may be in some stage of felling at the same time, we do not know if beavers are operating some system of selection or not. One often finds trees abandonded in the course of felling whilst others are felled overnight, and this raises the question of whether the beavers are sampling their potential food for some quality, like trace elements, undiscernable to the human eye. Although it is frequently related that the beaver can accurately fell trees in the right direction, this is not the case, the trees being in any case prone to falling in the water as the canopy on that side is better developed. Nor is there any truth in the medieval belief that

'slave' beavers were loaded up with timber then dragged off to the water on their backs. In any case the truth is perhaps a little more interesting for beavers also construct true canals, often over 100 metres long, for ease of travel and transport of food in low-lying marshy areas.

Trees are felled to provide food, of course, and even colonies with large lodges and many dams will use the left-overs rather than fresh material for building. This is because only the bark is eaten, the woody core being discarded. Nevertheless, given the 'image' of beavers it is surprising how little of their diet is composed of bark. In spring and summer beavers eat a very varied diet of leaves and twigs of many species of shrubs, rhizomes of aquatic plants and parts of most riverside and marsh plants, even dandelions which are a great favourite at certain Swiss beaver colonies. It is probably fair to say that beavers could eat almost any plant material and the list of their food plants, culled from the European literature is over 200 species long. But certain species are preferred above others, and certain sizes in one category of species. Thus for aspen, the most preferred tree, trees between 20 and 50 cm in diameter are felled in preference to either smaller or larger specimens. This is in contrast to most of the other tree species in the diet, where the smaller diameter is most usually preferred, giving rise to a negative frequency distribution curve. Willows are one of the most frequently felled trees and it is perfectly possible to pass through a patch of carr without being aware that beavers have been feeding in the area owing to the thinness of stem at which they prefer to cut willow.

Young beavers begin to eat solid food after only a month and start off on leaves and small twigs brought to them by the adults. When the young begin to forage on their own their cries can lead to the older animals giving up their own food for them. The very close family life of beavers is based on the mother; the other beavers respond far more readily to her warning signal, the famous tail-slapping of the water, than to other adults and she it is who is largely responsible for marking out the territory with heaps of castoreum-dosed vegetation. The female is the dominant partner of the adult pair and successful breeding on beaver farms is said to depend on selecting a pair where the female is the slightly larger animal. The male usually leaves the home lodge when the kits are born and takes up temporary residence in a nearby burrow. The home lodges must be quite crowded in early summer for not only are there young of the year but of the previous year too, and these do not leave home until they are two years old. These emigrating youngsters serve to colonise new areas, perhaps a stream where beavers died out for some reason, or a recently burnt watershed where aspen has begun to grow and the habitat become favourable.

Such close reliance on the home lodge led to population estimates being based on the number of lodges, but since it is now known that occasionally two or more lodges are built by the same family it is now considered safer to base such calculations on the number of winter stores. These are built, most especially in the north of their range, to tide beavers over the winter and are easily accessible under water even when the surface has frozen over. One family only builds one store and thus, knowing the average size of a beaver family, it is a simple matter to multiply the number of stores in an area by the requisite figure. In Europe, where the average litter comprises less than three kits, a family is usually assumed to comprise six beavers while in America, with their slightly larger litters, this figure is taken to be a little higher.

With litters of this size even the European beaver appears capable of multiplying rapidly. Certainly one successful season would see a situation where the parents, in biological terms, replaced themselves. By and large, however, beavers have stable populations and, except in the far north where plant growth is climatically inhibited, they do not appear to eat themselves out of house and home. Indeed the beaver was used by Wynne-Edwards as an example in support of his hypothesis of social control of population size. Whatever the nature of this control various factors come into play

to limit the size of beaver populations. In certain parts large predators can be responsible for some mortality, and even eagle owls are blamed for loss of young beavers in Russia for instance. There is a significant amount of pre-natal loss also and older animals can succumb to disease, particularly tularemia which occasionally reaches epidemic proportions in North American populations. Taken together with accidental loss, intraspecific aggression and deliberate and accidental killing by man it is, then, not surprising that beaver populations do not rapidly expand. In the most successful reintroduction project in Switzerland, for example, twenty years has been sufficient for an increase to only 60 animals from the original two pairs, and this in the absence of predators in ideal, protected habitat.

From the earlier discussion it will be clear that Norfolk, with its abundance of quietly-flowing waters and low-lying carrs provided ideal conditions for beavers. It will not be surprising then to learn of the richness of the collection of beaver material held by the Castle Museum in Norwich, particularly that which forms part of the C.B. Rose collection. This contains several jawbones, leg-bones, vertebrae and ribs from sites at Downham and Fordham Fens. Other remains have come from Burwell Fen and Southery Fen and it is interesting that all the attributable beaver specimens derive from the west of the county. This would seem to be due to the fact that drainage works were being carried out in the area at a time when collecting was an established pursuit, while the making of the broads, which undoubtedly would have revealed many skeletal remains, took place so much earlier. Research at the University of East Anglia has established the environmental conditions of the Yare and Bure valleys prior to the creation of the Broads, and incidentally shown that the beaver would have been at home here.

This prompts the interesting but difficult question of the effect of the absence of this large herbivore on present-day wetland habitats; interesting because the idea of reintroductions as creative acts of conservation is gaining ground but difficult because the environmental dynamics of even present-day ecosystems are poorly understood. The effect of beavers has been partly studied in the United States where it is generally acknowledged to be beneficial to waterfowl and course fish, by increasing the available habitat and cover, and in certain circumstances to herbivores such as deer to providing browse. The beaver is a more controversial character where game fish are concerned as, on occasion, a dam can cause an unacceptable increase in the water temperature. In sites where building of dams floods out trees, the presence of beavers can be improtant to hole-nesting, insectivorous birds such as wood-peckers. A recent experimental study of the effects of various habitat alterations to riparian forest, including some treatments mimicking the effects of beavers, showed such alterations to increase the diversity of both birds and small mammals. One is certainly inclined to think that beavers do have a beneficial effect overall, but while such aspects as the flow of nutrients and energy through beaver-inhabited wetland ecosystems remain to be investigated one can merely speculate. Speculation, though, is a valid intellectual exercise, provided it is declared as such. Finally, let us consider the possible effects of a large aquatic heribvore. Experience with the coypu has shown us that the beaver will keep waterways open, providing habitat for waterfowl even in still waters where the beavers would not build any dams. The coppicing effect of selective feeding on willows and alders must also result in the beaver having a considerable effect in retaining open marshes which otherwise would quickly scrub up into carr and eventually woodland. Is this the answer to the conundrum I term the "Paradox of the Bittern" which asks why creatures of open marsh such as the bittern, water-rail and bearded tit were able to survive when their habitat disappears at a far faster rate than that at which it is created?

Of course, the economic effects of the beaver must be assessed before any reintroduction can be contemplated but these should be clearly distinguished as a separate

argument since there are potential economic benefits as well as the undoubted risks, to timber crops in particular. This is not the place, however, to enter into these arguments and the topic of beavers in Norfolk must regrettably be left for the time being. It is to be hoped that this short account will have stimulated interest in the ecology of beavers. For further information the reader is urged to try the European literature where possible and a short list is appended to guide him:

Rodents; their lives and habits. Peter W. Hanney (David & Charles, 1975) contains a particularly interesting brief account of the fur trade.

Mammals of the USSR and adjacent countries. S.I. Ognev (1963 translation by Israel Program for Scientific Translations of 1947 original) pp 28-370 of vol. 5 give an authoritative account of beaver biology although the ecological material has been to some extent superseded.

Return of the beaver. Nick Pinder, Country Life, Feb. 7 1980 (167; 4309) pp 374-376. An account of the near extinction of the European beaver and its conservation through reintroductions, as well as giving examples of feeding and building behaviour based on observations of reintroduced and native beavers in Switzerland and France.

My beaver colony. Lars Willson (Souvenir Press & Pan) 1969 translation of a Swedish original. Delightful account of keeping and studying European beavers and the close observations that were possible of breeding, maternal and dam building behaviour.

Classified Notes

INSECTIVORA

Our contributor who uses the B1149 between Holt and the outskirts of Norwich regularly during the year noted 44 dead Hedgehogs *Erinaceus europaeus* on that particular stretch of road. It was noticeable that they were seen mainly in villages where there are gardens or in areas with hedges and deciduous, but not coniferous woodland. Most were seen at Heydon (12) Horsford (11) and Edgefield (9). In the open country through Cawston and most of the Haveringland—Hevingham stretch their numbers were very low: 1, 2 and 1 respectively. Another regular counter of road casualties noted 10 between Swaffham and Blakeney on July 30th and observes that July was almost without rain until 28th.. Other observers have noted an increase in casualties after a wet night. One late youngster at East Tuddenham found dried dog-meat, puppy size, much to its liking when it was foraging during daylight hours. It continued to make use of this very convenient source of food until the 1st January 1980 when it presumably hibernated. The happiest hedgehog story of the year was the account we read in the press of the seven motorists who spent up to a quarter of an hour waiting and watching a family party cross the road in Taverham.

The small mammal most frequently noted by the signs it leaves is the Mole *Talpa europaea*. By the number of mole hills and irate gardeners across the county it appears to be generally increasing. A long-suffering West Runton member tells of co-existance with one in the garden all through summer until less patient neighbours objected. An orange colour-variant was caught at Ditchingham. On February 18th mole runs were seen to be cracking the frozen snow surface at Corpusty.

From the many reports of Common Shrews *Sorex araneus* from widely scattered localities, including the centre of King's Lynn, it seems that 1979 was a good year for this insectivore. Cats will catch and play with them but find them distastful. One cat dropped its prey by the edge of a garden pond. The shrew swam to the other side and ran under a foxglove leaf but was still in view. With the cat looking on, it caught a worm and began to eat it, but was itself captured for the second time. After taking it a few steps along the garden path the cat dropped it, presumably having lost interest and the shrew ran off, no doubt still hungry.

Pygmy Shrews *Sorex minutus* were reported from 16 localities. In Wereham one was in the greenhouse and one under the stairs! Both species of shrew are often found dead and contributors are recommended to check identification features and look about systematically especially during late summer and autumn. Systematic searching by Dick Jones based at King's Lynn Museum has mapped many mammal species in West Norfolk including 8 sites in that area for the Water Shrew *Neomus fodiens*. Owl pellets produced another from Helhoughton Common while yet another was found dead in a garden at Thorpe End, Norwich. Others were seen at Cley and Holme Dunes. This was our best year for records of these fascinating little creatures.

CHIROPTERA

The investigation of all kinds of old underground workings, carried out in the main by John Goldsmith, with the hopes of finding more winter roosting sites used by bats has continued to gain momentum and has produced more records of mainly Daubenton *Myotis daubentoni* and Natterer's *Myotis nattereri* bats. Most of the old ice-houses, chalk workings, kilns and tunnels have probably been located now, but just in case any have been overlooked, any information regarding possible sites would be appreciated. Further Noctule *Nyctalus noctula* sightings were reported from Hethersett, East Tuddenham, Bawburgh/Melton, Snettisham and Ludham.

The commonest sightings of bat species was of Pipistrelles *Pipistrellus pipistrellus* and a number of these were confirmed by the finding of dead specimens, some of which came to the Editor, carefully wrapped in plastic bags, through the post. Small mammals are surprisingly light in weight and add little or nothing to basic postage rates. One of these was found inside the church at Castle Acre. Churches have traditionally, with justification, been regarded as suitable sites to look for bats and also for barn owls, those good friends of mammal recorders. Both are becoming much more difficult to find and a systematic look at churches in East Norfolk hoping to find owl pellets to analyse has produced dissappointingly few. It is, on the brighter side, good to realise that so many more members are taking an interest in chiroptera, this least understood and most misunderstood group of mammals, some of them making the effort to overcome the irrational repugnance that has further estranged the group from so many people.

There was great excitement in September when it was thought that we had the first county record for Leisler's Bat *Nyctalus leisleri*. The specimen in question was a road casualty at Snettisham. Leisler's bat belongs to the same genus as the Noctule which it

esembles but is distinguished mainly by its smaller size, by colouring and by detailed measurements. These latter, when re-examined by the appropriate experts, eventually dashed our hopes and proved that we had another Noctule.

Perhaps our disappointment can be a little assuaged by the definite record of a Barbastelle *Barbastella barbastellus* which was found hibernating in a disused lime kiln on January 24th in West Norfolk. It is assumed that it moved there during the very cold weather and it was not to be found on February 20th when the site was examined again. Hibernating bats do move from site to site during the winter to find most suitable levels of temperature and humidity. There are previous records of this bat in Norfolk but no positive identifications have been made for several years.

LAGOMORPHA

The extremes of the colour range were reported during the year amongst the Rabbit *Oryctolagus cuniculus* population. A white one was seen at Brancaster Staithe and a black one at Oulton Park. From the numerical point of view the extreme contrasts between localities mentioned in recent years did not seem to recur. The hard spring held back the breeding season and when the population did begin to rise more consistent attempts at control aided by myxomatosis in many districts kept a check. Where rabbits have been relieved of both of these constraints naturally they are very much in evidence. As each season passes so the emphasis lies more with the former rather than the latter as young inherit resistance to existing strains of the disease. A five to six-week old young rabbit was seen at Edgefield on December 2nd. On Bacton Gas Site they have discovered the advantages of living in the concrete cable ducting.

It is very difficult to assess the true situation regarding the Brown Hare *Lepus capensis*. Most contributors repeat the story of the past few years and tell of fewer sightings, particularly in Central Norfolk. However, many go on to report a much healthier situation in a particular area, notably the Yare and Waveney Valleys, the marshes approaching Breydon being quoted by several observers. More have been seen on some of the Norfolk Naturalists' Trust reserves. Our "roving reporter" from Swaffham who travels extensively round Norfolk throughout the year sends the following information: Road casualties plus live sightings in 1977 — 125, in 1978 — 92 and in 1979 — 61. Quite dramatic figures from this one source of information. Many factors are involved, not least the increased popularity of hare as a delicacy.

RODENTIA

The Red Squirrel *Sciurus vulgaris* was able to maintain its numbers on Forestry Commission land in Breckland but apart from that the picture was uniformly depressing. Dr Ian Keymer is still trying to continue his investigation into "red squirrel disease" but his chances of success are obviously vanishing rapidly. Naturally he would welcome any recent corpses of red squirrels at the Vetinerary Investigation Centre, Jupiter Road, Norwich, and probably better still, information of any squirrel that is still alive but appears to have contracted the disease. He tells us that during the year he saw no red squirrels at Horsford or Felthorpe, an area he knows well. Some other old strongholds could muster no more than a single sighting and still others none at all. References have come from scattered localities in the West of Norfolk, from Corpusty, Itteringham, Sprowston, Blickling, Wells, Stanford, Briston, Holkham, Marsham Heath, Swaffham, Dilham and Wretham Reserve.

The list of place names that could be printed for the Grey Squirrel *Sciurus carolinensis* would take up an overlarge portion of the report. Their natural rate of increase more than kept up with the large numbers killed and many contributors tell of finding them in previously unlisted districts. The grey squirrels lack of concern over crossing extensive open areas and their boldness are both illustrated by the one that was seen sitting on the window sill at the Hewitt Senior School, Norwich, in May. These factors do make it much easier to see greys than reds but against this there is their ability to exploit habitats quite closed to the reds to which must be added their much smaller territorial requirement. We are reliably informed that there are now more grey squirrels in the Stanford Training Area than there were red squirrels at their peak.

There were few reports of the Bank Vole *Clethrionomys glareolus* which probably reflects upon the number of observations rather than the number of voles. This is certainly where an examination of what the cat has caught may well prove informative. Short-tailed field voles *Microtus agrestis* in Corpusty found shelter during the cold February under a shed roof that had been displaced by the wind onto the ground. Later in the year they nested under a sheet of tin in the garden and often had a toad for company. When the time came to cut the long grass in September, young voles, toads and frogs had to be rescued before the operation could take place. In Pulham, a Short-tailed field vole was found dead by the roadside on September 23rd and when examined was found to be carrying three ticks the largest of which measured about 7 by 4 mm. Water Voles *Arvicola terrestris* were recorded at thirteen county-wide sites.

The Wood Mouse *Apodemus sylvaticus,* a widely distributed and numerous species, received the number of mentions more in keeping with its status than in previous years. As can be expected with such a common mammal, all sorts of odd individuals are likely to turn up. A "pied" specimen, covered with white blotches was caught in Holt and in West Runton one was observed sharing food put out for birds on two days in November. Two contributors speak of small rodents on the road at night. One definitely saw more Wood Mice on roads near Buxton and the other has seen small, leaping rodents on roads on windy nights, assumes they are Wood Mice and asks if others have seen the same kind of thing. Perhaps we will have some comments for our next report.

The Harvest Mouse *Micromys minutus* was recorded in seven locations. Nests were found near Dereham and Strumpshaw and there were owl pellet remains from Helhoughton Common. The other four were found in the West Norfolk Survey.

Living up to its name and popular image, examples of the House Mouse *Mus musculus* were caught in the greenhouse and under the stairs at Wereham and in a corn bin at Erpingham. Elsewhere they were up to normal numbers. Members of the Brown Rat *Rattus norvegicus* species seemed to be trying to prove their names wrong for both white and black colour varients were seen. These latter were all examples of the common or brown rat and not the ship, or black rat *Rattus rattus* which has not been recorded in the county for many years. Where they do occur there is considerable colour variation, far more in fact than in the brown rat. Returning to the Brown Rat, the following set of road casualties counted has been submitted:— 1977 — 52, 1978— 107 and 1979 — 93. Other contibutors mentioned high numbers and indeed one went so far as to use the expression "plague proportions". This was from an area that would appear to be well managed and demonstrates the ability of this highly adaptable rodent to make full use of the slightest advantage.

Dr L. M. Gosling sends the following report on Coypu *Myocastor coypus* and takes the natural annual cycle, spring to spring, this being the best way to give an accurate assessment of the situation: "About 6,409 coypu deaths were recorded during 1979 and 5,571 of these (87%) were killed by the trappers of coypu control. This total was 45% lower than that recorded in 1978 and this decline reflects the impact of the 1978/79 winter which, although not approaching the 1962/63 winter in severity, was none-the-

ess cold enough to give the population a set-back. However the year total does not reveal the rapid increase in numbers in the last half of the year. This followed a period of summer breeding when nearly all of the adult females in the population produced litters after conceiving at the end of the winter. Significantly for these young the 1979/80 winter was of a mildness comparable with those of the 1970-75 period when Coypu numbers increased rapidly. As a result the kill rate, and the live population in the spring of 1980 are back to the levels of the autumn of 1978.

Thse events demonstrate once again that the existing Coypu Control trapper force is not large enough to prevent the population from increasing between years separated by a mild winter. Additional cause for concern is further evidence that the range of the population is increasing: in the first few months of 1980 confirmed reports had already been received from three sites between Colchester and the Blackwater estuary. Evidently the 1978/79 winter did not eliminate outlying colonies as appeared to be the case in 1962/63."

CETACEA

There were few records of the group during the year and these were confined to the occasional common porpoise *Phocoena phocoena* seen off Holme and the one dead specimen washed up on to the beach there in October.

CARNIVORA

The Fox *Vulpes vulpes* is another mammal that arouses very mixed and variable emotions. In some districts it needs every bit of its proverbial cunning to escape the lethal hand of its one enemy. One large West Norfolk estate, for example, is reported to have killed 400 foxes during the past eight years, an average of roughly one per week. The fact that there are still foxes in the district suggests that it is an extremely resilient species and that local conditions must be very favourable. It would be interesting to learn how soon the vacuum is filled after the death of the previous territorial occupier. In contrast, the Editor has spoken to two farmers within a few days of writing these notes who have expressed great pleasure in the presence of foxes on their land and given it as their opinions that a state of balance exists between them and the wild rabbits. A few reports spoke of lower numbers, for example at Horsey and one highly organised fox shoot in North Norfolk produced no prey during two hours of beating. However, the overall situation appears to be favourable from the fox point of view.

Reports of Badgers *Meles meles* in the eastern half of Norfolk passing through a garden and exploring an old sett keep the hope alive that there will eventually be recolonisation of old setts. It is very pleasing to know that many people are prepared to give this larger carnivore the benefit of the doubt. Strictly speaking they are omnivorous and the most important single item of diet is the humble earthworm. Three badgers were reported to have been caught in snares set for foxes, but were released. The most significant item of news was the report that Lord Melchett had seen one of the female badgers on his farm at Ringstead emerging from the sett with three cubs. The significance is that the colony was restocked with young badgers that had been bred at the Norfolk Wildlife Park. This is the first successful attempt to establish a breeding colony of wild badgers from stock bred in captivity.

It is sad we cannot describe a similar success with Otters *Lutra Lutra* but with this species the story becomes more depressing. Only the preservation of suitable habitat

can really justify any optimism for the future and this diminishes or is put under threat faster than counteractive steps can be taken. There are so many interests and so many authorities involved that even rapid emergency action to help one of our few remaining pairs proved to be impossible in July when a pair was seen using a quiet broad at Wroxham, a haven for wildlife. The broad was due to be "developed" and "improved" for the use of boats and the process could not be halted. How we abuse our language as well as our wildlife!

There were ten reports of Stoats *Mustela erminea* in ermine or partial ermine during the spring of 1979. There is the possibility that three of these may have been the same animal seen along the Hockham to Wretham road but others were seen at Santon Downham, Barnham Common, near Swaffham, one killed by a cat at Saham Hills, Irmingland Hall, Munford and West Runton. The overwhelming majority of these it will be noted were in Breckland. A normally marked stoat was seen to make five double journeys carrying food across the road at Stradsett. Less successful was the one watched on the road near Blickling church where it chased a rabbit backwards and forwards. Finally the rabbit went into one hedge and the stoat into the other. Perhaps the policeman watching with our contributor put it off! At Fustyweed gravel pits a stoat was seen to make what seemed an inexpert kill of a rabbit and was surrounded by a group of birds including five yellow wagtails. The stoat dropped the rabbit and made a dive at the nearest wagtail which only just managed to escape.

Weasels *Mustela nivalis* were frequently recorded and presumably had a numerically good year. A single-minded individual trotted along the path beside the forest at West Harling, looking neither to right nor to left, sniffing incuriously as it passed within a yard of the observer. It transpired that it had also passed by two other members of his family in the same way some half mile distant. Cats at Itteringham were seen to account for two weasels.

American Mink *Mustela vison* were reported from Salthouse and the Waveney. Most of the sightings made over the years of these carnivores have come from members of the coypu trapping team.

PINNIPEDIA

A seal was reported in the Yare at Reedham in April while at the other end of the county and the year a Common Seal *Phoca vitulina* was in the Ouse at Wiggenhall St Germans. The greatest number of common seals reported to have been counted at any one time was 80 at Blakeney July 13th. Grey seal *Halichoerus grypus* pups were found on the beaches during the autumn but not to the same extent as during the previous year.

ARTIODACTYLA

Norfolk is very fortunate in the number of deer and variety of species living here. We have the variety of habitats that suit various members of the Cervidae family both native and introduced. Not that the picture is without its darker patches for the knowledge that deer are in the district spark off varying reactions.

Our two recent additions to the list, the Muntjac *Muntiacus reevesi* and the Chinese Water Deer *Hydropotes inermis* being small, and very secretive, have been able to maintain and probably enlarge their foothold here. The extremely difficult conditions in the spring did take its toll particularly of the latter but many survived and the species appears to be taking in more territory in Broadland. Probably the best view was had by David Brown, Warden at Ranworth Conservation Centre, during the very cold spring, who was able to watch a Chinese Water Deer slowly crossing the frozen broad, occasionally stopping to prick its ears towards unexpected but not alarming sounds. In normal conditions there are so many places in Broadland where a small deer can safely tread but a man would be very unwise to follow. The Muntjac has been able to find enough dense, drier woodland and although sightings are few, indications are that it is doing well, especially in the western half of the county.

The greatest concentration of deer is in Thetford Forest which holds quite large numbers of Roe Deer *Capreolus capreolus.* They seem to have few real problems apart from loose dogs, more their thoughtless owners, and motor-cars. Other districts can produce their Roe deer but again in the west.

As we continue to increase in physical size the story becomes less happy. The white and black herds of Fallow Deer *Dama dama* in Houghton and Melton parks continue in their artificially protected conditions but outside the larger deer have more than natural pressures to content with. The small but thriving feral herd in the Felthorpe—Horsford—Taverham area now has a large query mark against it, placed there by latter-day Robin Hoods.

Red Deer *Cervus elephus* slots and sightings were reported from scattered localities. It is amazing how such a large and seemingly conspicuous animal can fade into the background and often when positive identifications have been made observers are not always able to make accurate counts.Small parties can be said to move about certain parts of Norfolk but the greatest numbers, though reduced in size and quality is the forest herd at Thetford. We hope the vigilance of the rangers will enable it to continue.

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Young Ornithologists' Club (Norwich Branch)

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Editor Dr E. A. Ellis

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EARTH-STARS (GEASTRACEAE) IN NORFOLK AND SUFFOLK

by E. A. Ellis

Earth-stars or star-puffballs, characterised by the stellate form assumed by their outer layer (exoperidium) when it splits open to reveal the central, spore-bearing "puffer" (endoperidium) at maturity, have received much attention in East Anglia since Charles Bryant, of Norwich first made detailed reference to them in *"An historical account of two species of Lycoperdon"* in 1782. Unfortunately, he contrived to place a wide range of forms met with locally under the headings of just two species, as is clear from the series of twenty drawings illustrating his paper. He was soon taken to task for this by Thomas Jenkinson Woodward of Bungay in a paper entitled "An Essay towards an History of the British Stellated Lycoperdons: being an account of such species as have been found in the Neighbourhood of Bungay in Suffolk" published in 1794 (*Trans. Linn. Soc.* 2: 32-62). Subsequently, scientific names given to puffballs, earth-stars and other gasteromycetes before the publication of D. C. H. Persoon's *Synopsis Methodica Fungorum* in 1801 were invalidated by the rules adopted internationally for application to these fungi, except where they came to be adopted clearly by Persoon or later authors. Persoon did in fact cite some of Bryant's figures and Woodward's names and descriptions in his account of the earth-stars. During the 19th century many further species were described and named by mycologists in Britain and elsewhere, in the course of which a good deal of confusion arose over questions of priority and synonymy. Thus we find different authors and collectors recording the same fungi under different names and in the absence of voucher herbarium material it is often not possible to know to what species, as currently understood, their references apply. Since East Anglia has produced a great many records of these fungi during the last two hundred years, the present account attempts to bring order from past confusion. This has only been made possible through the diligent research on British and European earth-stars undertaken by J. T. Palmer over the past thirty years during which he has produced numerous important papers on them. In dealing with the Norfolk and Suffolk records now, I have adopted the names considered most properly applicable to the British species by Palmer in his *Chronological Catalogue of the Literature to the British Gasteromycetes* (from *Nova Hedwigia)* 1968, having also enjoyed the benefit of his personal friendship and guidance in the field and otherwise when looking at earth stars in recent years.

To assist with identification, examples of seventeen species are illustrated here, together with original drawings of spores from fifteen of them.

Astraeus hygrometricus (Pers.) Morgan FIG. 1 (1,2,3), FIG. 3 (1). Easily recognised by its many thick, hard, darkly "tessellated" hygroscopic rays, 5 - 8 cm. in diameter when expanded. The inner peridium is sessile, with a small unstruct-

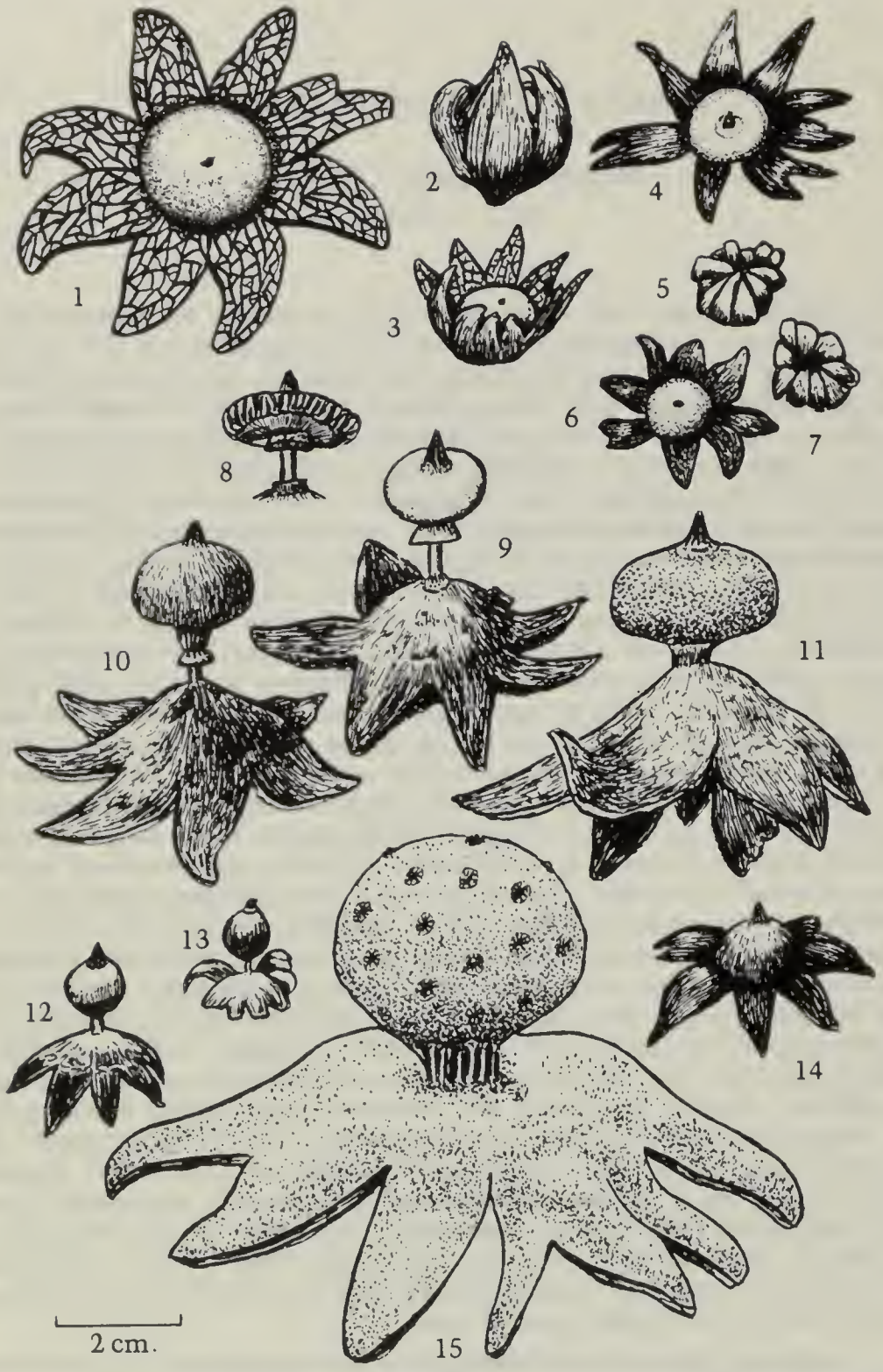

FIG. 1 1, 2, 3. Astraeus hygrometricus. 4, 5. Geastrum recolligens. 6, 7. G. floriforme. 8, 9. G. striatum. 10. G. pectinatum. 11. G. berkeleyi. 12. G. nanum. 13. G. minimum. 14. G. badium. 15. Myriostoma coliforme. *Drawn by E. A. Ellis.*

ured mouth. Norfolk: one on a sandy bank, Rackheath, Oct. 1863, K. Trimmer; Holt, December, 1927, C. P. Petch. Suffolk: Sandy wood, Bury, E. Skepper.
Geastrum badium Pers. FIG. 1 (14), FIG. 3 (2) One of the smaller species, with about six thin rays, the endoperidium sessile, with a prominent sulcate mouth. Suffolk: on sand, Dunwich Heath, October 1979, M. B. Ellis.
G. berkeleyi Massee FIG. 1 (11). The shortly stalked endoperidium is granular on the surface and has a prominent, conical, sulcate mouth.
Norfolk: "Blakeney Brecks", October 1925-26, F. Yeo.
G. coronatum Pers. FIG. 2 (11,12), FIG. 3 (3) Variable in size, but commonly rather large and robust. The rays are fleshy and at first cream-coloured, seven to twelve in number, later becoming brown or tan-coloured with an irregular patchwork of shrivelled, dark skin on the upper surface. The endoperidium appears sessile in young specimens, but stalked at maturity, usually appearing lead coloured or greyish brown, with a fairly prominent fimbriate mouth. The very dark spores are characteristic. This is one of our commoner species, to be found under hawthorns on hedge-banks and under conifers.
Norfolk: Attlebridge, 1864, and Skeyton, 1867, K. Trimmer; Hillington, October 1880, C. B. Plowright; Drayton, 1938, R. M. S. Brown; East Wretham, 1939, J. M. Lambert; Blofield, 1940, T. Hyde Parker; Eaton, 1945, G. J. and L. I. Cooke; Upper Hellesdon, 1945 and 1948, E. A. Ellis; Claxton, 1948 and 1951, R. H. Sewell; Surlingham, 1946 and 1951, E. A. E.; Halvergate, 1951, Mrs R. Key; Ingham, 1953 A. R. Disney; West Bradenham, 1971, Mrs Tubby; New Costessey, 1978, C. A. Blenkiron; Saxlingham Nethergate, 1979, Mrs M. Nichols; Rockland St Mary, 1979 and 1980, E.A.E.; Intwood, under yews, 1980, Mrs B. Dwyer. Suffolk: Bury St Edmunds, 1957, E. Skepper; Lowestoft Denes, 1950, J. G. Warner; Brandon, under Thuja, 1978, J. A. Fitch; St Olave's, 1938 and Reydon, 1979, E. A. Ellis; Lower Ufford, 1979, Mrs J. Raven. Some of T. J. Woodward's references to *Lycoperdon stellatum* in the neighbourhood of Bungay almost certainly appertain to this species.
G. floriforme Vitt. FIG. 1 (6 and 7), FIG. 3 (4). A small, strongly hygroscopic species with five to eight hard rays and a sessile, scurfy endoperidium with a simple, unstructured mouth. First recorded in Britain from a Lancashire garden, c. 1952, by T. J. Palmer, this species has appeared regularly in autumn under *Cupresssus macrocarpa* in a Guernsey garden since 1975 (specimens sent by N. Jee, det. E.A.E.) and a single example appeared on a sandy hedge-bank at Reydon, Suffolk, in May, 1979, E.A.E.
G. fornicatum (Huds. ex Winch et al.) Hooker FIG. 2 (6) and FIG. 3 (5). A robust species, standing erect on four (occasionally five) stiff, pointed rays adhering by their tips to a cup seated in the ground; the stalked endoperidium has a basal thickening (apophysis) and the mouth is unstructured. It grows amongst dead leaves on the ground, often under conifers. Both C. Bryant and T. J. Woodward were familiar with this fungus in the eastern parts of Norfolk and Suffolk in the latter half of the 18th century. K. Trimmer found it plentiful on a shady hedge-bank at Billingford, Norfolk, in 1872 and more recent records from this county include East Dereham, 1924, Mrs M. Pett; Crown Point woods, 1937, R. J. Colman; Sprowston, 1954, W. E. H. Fiddian and near Norwich, 1974. Henslow and Skepper, in Flora of Suffolk (1861) say that it was 'occasionally met with' in that county and it was found in the neighbourhood of Ipswich in 1946 by S. C. Porter.

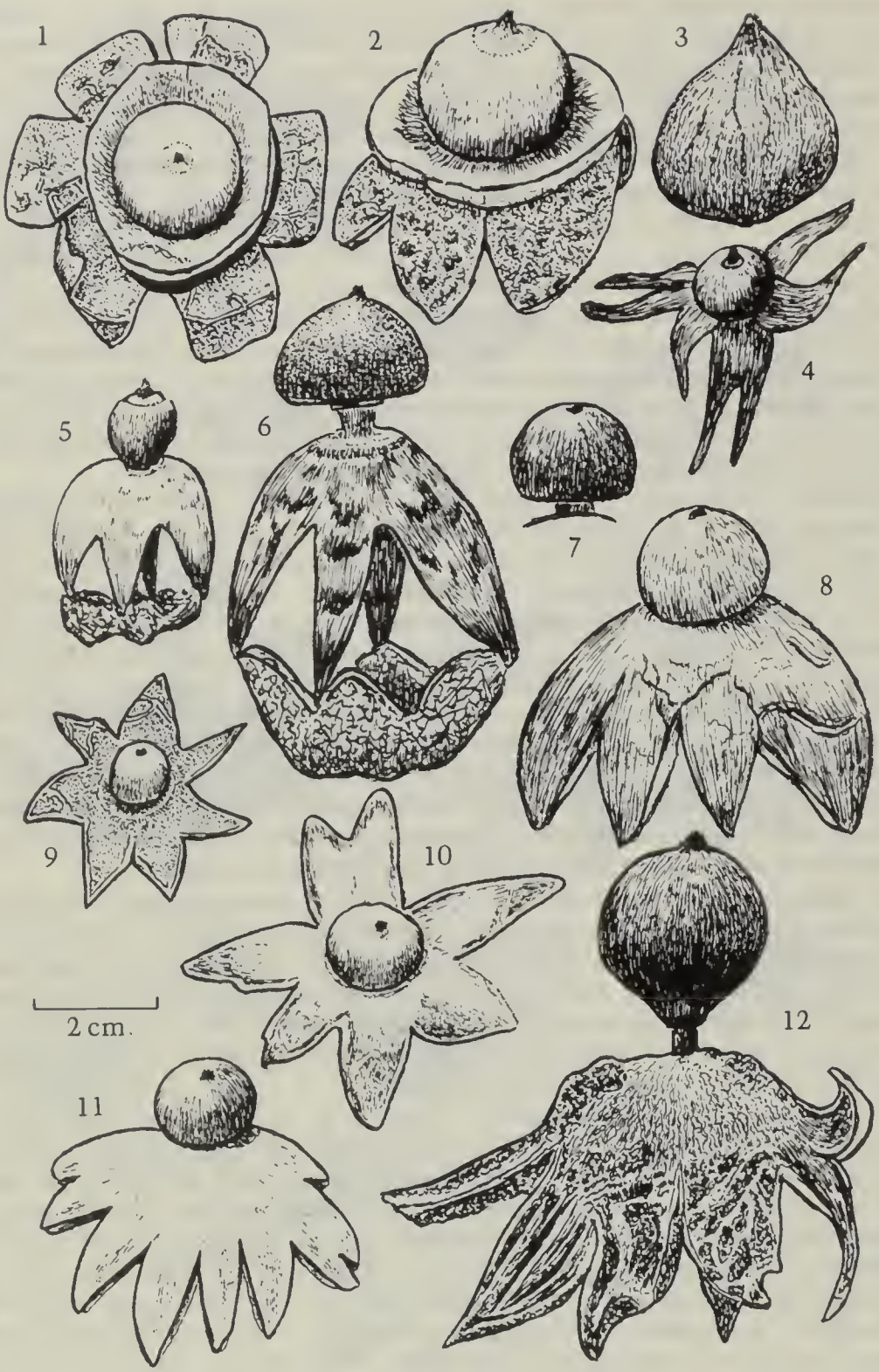

FIG. 2 1, 2, 3. Geastrum triplex. 4. G. saccatum. 5. G. quadrifidum. 6. G. fornicatum. 7, 8. G. vulgatum. 9, 10. G. rufescens. 11, 12. G. coronatum. *Drawn by E. A. Ellis.*

G. minimum Schwein. FIG 1 (13) and FIG. 3 (6). Growing typically on bare soil amongst grasses, this very small species has seven to nine rays, which are brownish above and white beneath, becoming revolute. The white, glossy endoperidium is shortly stalked and the broadly conical mouth has a frayed, revolute margin. Norfolk: a single example, identified by T. J. Palmer, was found on a mossy bank under *Pinus nigra* adjacent to coastal dunes at Holkham, 6 October, 1958 by E. A. Ellis.

G. nanum Pers. FIG. 1 (12) and FIG. 3 (7). A small species found mainly on sandhills, it has rather numerous downward arching rays which become grey and papery on drying; the endoperidium appears sessile at first and then shortly stalked, greyish brown, with a prominent sulcate mouth.

Norfolk: T. J. Palmer has noted that W. J. Hooker gave good figures of this species (as *G. striatum)* in Plate 575 of Flora Londinensis (c.1819), stating that it was common on Yarmouth Denes. This may also have been the *'striatus'* found on sand hills at Winterton and in shady places at Caister by K. Trimmer in 1861. M. J. Berkeley's reference to *G. umbilicatum* Fr. on sandy denes near Yarmouth also seems to fit here. Recent findings include those at Scolt Head Island, 1949, Mrs D. I. Boardman and Burnham Overy, 1979, C. P. Petch. Suffolk: A. Mayfield's (1948) record of *G. umbilicatum* from a sandy bank at Foxhall may belong here.

G. pectinatum Pers. FIG. 1 (10 and FIG. 3 (8). One of the larger species found typically under conifers, this has a long-stalked endoperidium with a collar and long striations at the base; the mouth is prominent, conical and sulcate. The blunt, peg-like ornamentation of the spores is distinctive. Norfolk: Holkham Meals, under pines, November, 1954, T. J. Wallace and in the same habitat, October, 1958, J. T. Palmer and E. A. Ellis.

G. quadrifidum Pers. ex Pers. em. Pers. FIG. 2 (5), FIG. 3 (9). Like *G. fornicatum*, this relatively small species has four (occasionally three or five) deeply cut rays arching downwards with their tips adhering to a somewhat ragged, cup-like base embedded in leaf-mould. The endoperidium is shortly stalked, with an apophysis, often egg or pear-shaped and bluish grey in colour; the mouth, though small, is definite, smooth and surrounded by a broad pale band below. Usually gregarious on pine-needle litter. Although said to be common in many parts of Europe, where it is often mis-named *G. coronatum*, it has been found only a few times in Britain, chiefly in Gloucestershire. The presence of a limy subsoil appears to favour it and as East Anglia's heavily afforested Breckland region would seem to provide a favourable habitat, one might expect it to be discovered there in due course.

G. recolligens (Woodw. in With. ex Relh. em Sow.) Desv. FIG. 1 (4 and 5), FIG. 3 (10). A small species with about nine woody rays which are strongly hygroscopic, curling upwards to cover the endoperidium when dry. This capacity for responding to changes in humidity is retained indefinitely in herbarium specimens. The sessile endoperidium is of a reddish fawn colour and has a well-marked conical fimbriate mouth. FIG. X in Bryant's account of 1782 depicts this species, indicating its presence in Norfolk at that period. Woodward (1794) recorded it from hedge-banks at Earsham and Ditchingham in Norfolk and from Bungay and Mettingham in Suffolk. Further Norfolk collections include those made from hedge-banks at Hillington by C. B. Plowright in 1896 and 1897 and by H. Lindley Jones at Hellesdon, near

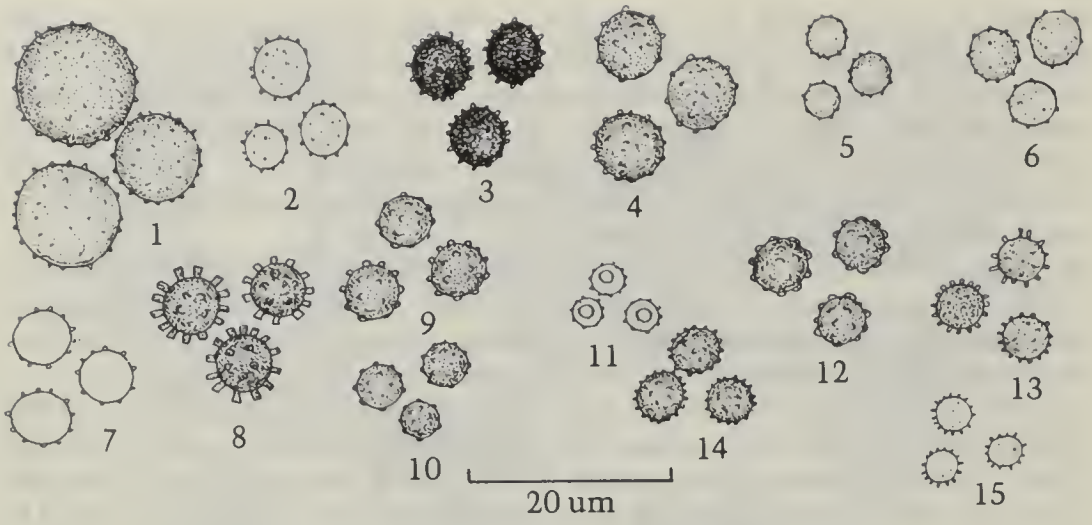

FIG. 3 Spores of: 1. Astraeus hygrometricus. 2. Geastrum badium. 3. G. coronatum. 4. G. floriforme. 5. G. fornicatum. 6. G. minimum. 7. G. nanum. 8. G. pectinatum. 9. G. quadrifidum. 10. G. recolligens. 11. G. rufescens. 12. G. striatum. 13. G. triplex. 14. G. vulgatum. 15. G. saccatum. *Drawn by M. B. Ellis.*

Norwich in May, 1938, these last being figured here, from the specimens in Norwich Castle Museum herbarium.

G. rufescens Pers. em. Kits van Wav. FIG. 2 (9, 10), FIG. 3 (11). Until very recently there was much confusion over the application of the epithet *rufescens* to earth-stars found in this country and two other common species have gone under this name in the past, notably *G. vulgatum* and *G. triplex*, therefore many of the records are unreliable unless backed by preserved specimens. As defined here, this species, which varies much in size (up to 9 cm. diameter in some fully expanded specimens), the five to ten rays are at first fleshy and whitish, drying yellowish brown, usually with pale margins and cracks. The endoperidium is sessile, subglobose and usually of a cinnamon-buff colour, with an unstructured mouth (a simple opening). The small spores have a distinctive central guttule. Critically determined Norfolk collections include the following in Norwich Castle Museum: Kilverstone; Drayton woods; Gresham School woods near Holt, 1954; Newmarket Road, Norwich, 1948 (all G. J. Cooke) and Mousehold Heath, under hawthorns, 1952 E. A. Ellis; additional records: Bacton Wood, 1977; woods at Seamere, Hingham, 1956; under beech and pine, East harling, 1980 and Holkham dunes, under pines, 1958, J. T. Palmer and E. A. Ellis.

G. saccatum Fr. FIG. 2 (4) and FIG. 3 (15). This species has several features in common with *G. triplex*, including the prominent fimbriate mouth surrounded by a silky zone, but lacks the cup-like portion of the fleshy exoperidium characteristic of that species. The specimen illustrated here, with its spores distinctly smaller than those of *G. triplex*, was collected at Earlham, near Norwich, by G. J. Cooke c. 1912 and is in Norwich Castle Museum herbarium.

G. striatum DC. FIG. 1 (8, 9) and FIG. 3 (12). Growing most frequently in leafy litter on hedge-banks, varying in spread from 2 to 7 cm., may have from six to twelve acute rays which are brown above and silvery beneath. The endoperidium, which is at first white and finally somewhat lead-coloured, has a collared stalk and a long, beak-like sulcate mouth.
Norfolk: Fig. xix in Bryant's account of 1782 clearly depicts this species. Later, K. Trimmer found it at East Carleton in 1849 and C. B. Plowright on North Wootton marshes in 1867. Other records include the following: Swanton Abbott, 1905, Rev. Mountford; Eaton, 1935, 1942 and 1943, G. J. Cooke; Stoke Holy Cross, under pines, 1937, 1938 and 1939, G. C. H. Chandler; Mangreen, 1943, G. J. Cooke; Claxton, 1946, R. H. Sewell; Rockland St. Mary, 1948, Surlingham, 1953, Upper Hellesdon, 1954 and Aldeby, 1971 (all E. A. Ellis); Barford, 1950, R. W. Turner and Mundford, 1973, R. P. Bagnall-Oakeley. Suffolk: in woods and on a sandy bank, Bury St Edmunds and about Bungay (Henslow and Skepper's *Flora of Suffolk*); Bentley, S. C. Porter; Mendlesham, A. B. Hurrell (per A. Mayfield, 1948); on a sandy hedge-bank at Reydon, 1979, 1980, E. A. Ellis.

G. triplex Jungh. FIG. 2 (1, 2, 3) and FIG. 3 (13). A medium-sized to large species, onion-shaped (fig. 2: 3) before expanding, has four to seven rays which are at first thick and fleshy, presently cracking irregularly and leaving a raised cup-like portion surrounding the mammiform endoperidium, which is sessile, cream to tan colour with a broadly conical, fimbriate mouth surrounded by a pale, silky zone. It would seem to be the commonest species occurring in East Anglia, growing in a variety of situations in leaf litter under both deciduous and evergreen trees and bushes of many kinds, both on the coast and inland. There is some uncertainty about early records, but the fungus is shown distinctly under *'Lycoperdon stellatum'* by Bryant in his figures iii and iv, proving that it was present in the Norwich area in the 18th century. Records from 1900 onwards are too numerous to present in detail, other than to give a list of localities: Bagthorpe, Braconash, Clippesby, Cromer, Drayton, East Dereham, Framingham, Gooderstone, Haynford, Hingham Hockham Mere, Holkham, Horsford, Kilverstone, Kirby Cane, Northrepps, Norwich, Ringland, Scolt Head Island, Stoke Holy Cross, Stratton Strawless, Surlingham, Taverham, Eaxham and Wells. Suffolk records have been fewer, known localities including Ashby (1981), Culford, Sudbourne and Shrubland Park (per A. Mayfield, 1948), Dunwich Forest (1979) and Redgrave Fen (1980): M. B. Ellis.

G. vulgatum Vitt. FIG. 2 (7, 8) and FIG. 3 (14). The exoperidium is at first fleshy, arched and pallid, often becoming flesh pink, divided into 5 - 7 rays which become variously cracked. The surface tissues flake away on drying, exposing the leathery and ultimately light yellowish brown fibrillose layer. The endoperidium appears sessile until, on drying, a very short, broad stalk becomes visible; the mouth is a simple, torn aperture and, as is shown in FIG. 3 (14), the spores are markedly larger, darker, more prominently warted than those of *G. rufescens* and lack the central guttule. This species has for a long time been mistaken for *rufescens* in this country and old records are largely unreliable. Its often reddish colour has seemed to fit the epithet *rufescens*, whereas the latter, as now understood, lacks the rosy suffusion.

G. vulgatum grows on leaf litter under a variety of trees and shrubs and occasionally amongst grasses. Norfolk collections include: Sheringham, 1936, 1937, G. J. Cooke; Mousehold Heath, Norwich, 1952, Surlingham, 1956 and Mouse Wood, Honingham, 1958 (E. A. Ellis), Briston, 1973, H. Williamson; Honingham (very small), 1973, A. Bull; West Harling, 1974. Confirmed Suffolk collections: edge of playing field, Reydon, 17 December, 1979, W. Rowe and with *G. triplex* under a lime tree at Ashby, bordering Fritton Lake, January, 1981, Mrs C. Jones.

Myriostoma coliforme ((With.) ex Pers.) Corda FIG. 1 (15). This very large earth-star, aptly called the "Cullender Puffball" by T. J. Woodward, is at first globose, ochraceous and covered with loose, dark scales, the top just showing above the ground. The outer crust then splits into 4-7 lobes, revealing the endoperidium, which is brown or lead-coloured with a silvery, minutely warted surface and numerous mouths surrounded by minute fibrils. There are several short pedicels at the base. T. J. Woodward (1794) knew this species from Earsham and Gillingham in east Norfolk and from Mettingham and Bungay on the Suffolk side of the river Waveney a short distance away. Its next recorded appearance was in a nettle bed alongside a hedge at Hillington west Norfolk in September, 1880 and it reappeared there in September, 1881, having been brought to the attention of C. B. Plowright (see *Trans. Norf. & Norw. Nat. Soc.* 3: 266-267. There have been no confirmed discoveries of this species in Britain during the present century.

In recent years the removal of many hedges on farmland and changes in the treatment of hedges generally have resulted in the loss of habitats favourable to earth-stars, while many dune, heath and woodland habitats have been eroded; nevertheless, these fungi still flourish here and there and are probably much un-recorded, especially in afforested Breckland.

Rather than appending a lengthy bibliography, I recommend reference to J. T. Palmer's chronological catalogue of the literature cited earlier. It should also be noted that a key for the identification of British Gasteromycetes is about to be published by the British Mycological Society.

THE DISTRIBUTION OF BLACKFLIES (DIPTERA : SIMULIIDAE) IN NORFOLK

by R. J. Post

School of Biological Sciences, University of East Anglia, Norwich.

Introduction

Blackflies are small blood-sucking flies with immature stages restricted to flowing water. Most palaearctic species are either univoltine with a single, usually springtime, generation, or multivoltine with several additional summer generations.

There is rather little published information on the blackflies of Norfolk. The most recent taxonomic revision of British blackflies (Davies 1966 and 1968 — although for updated nomenclature see Kloet and Hincks 1976) lists only three known sites within Norfolk, and only three species, *Simulium costatum* Friederichs 1920, *S. ornatum* Meigen 1818, and *S. argyreatum* Meigen 1838. However, *S. angustipes* Edwards 1915, *S. lundstromi* (Enderlein 1921), *S. equinum* (Linnaeus 1758), *S. erythrocephalum* (De Geer 1776), *S. austeni* Edwards 1915, and *S. morsitans* Edwards 1915, were also recorded from odd sites around the county borders.

Since then, in their survey of the river Wensum, Baker *et al* (1978) identified *Simulium ornatum*, *S. erythrocephalum* and *S. aureum* group (probably *S. angustipes*).

Of those species found in Norfolk it is necessary to briefly consider here the taxonomy of two difficult groups.

It is only possible to separate *S. angustipes* and *S. aureum* Fries 1824 by adult genitalia, or larval polytene chromosomes. All males examined for this study were *S. angustipes*, but they were not obtained from all sites. However, *S. aureum* is a species typical of the upland areas of North and West Britain, whereas *S. angustipes* is more typical of S.E. England, (Davies 1968). All specimens are recorded as *S. angustipes*.

Similarly absolute confidence cannot be claimed for all identifications of *S. ornatum*. *S. nitidifrons* Edwards 1920 is only easily separable from *S. ornatum* as adult females, but was never found. *S. nitidifrons* is typical of the upland areas of N.W. Britain, and occurs only sporadically in lowland Britain. *S. spinosum* Doby and Deblock 1957 is separable from *S. ornatum* only as pupae or as adult males, but was never identified. *S. spinosum* is typical of N.W. Britain and chalk springs in lowland areas. All specimens were recorded as *S. ornatum*. Furthermore it has recently been shown that *S. ornatum* exists as two sibling species in Norfolk, described on the basis of the larval polytene chromosomes (Post 1979), but these have not been distinguished in the present study.

Methods

Collections were of aquatic stages only, although adults were usually reared from field collected pupae. Specimens were removed individually, with forceps, from vegetation and stones taken out of the river. Most sites were visited only once. The appendix gives the exact location and date of each sample, and the maps show the distribution of the species.

Results

From new collections, at 73 sites, 10 species have been recorded during 1975 to 1979; *Simulium (Eusimulium) angustipes*, *S. (Eu.) angustitarse* (Lundstrom 1911), *S. (Eu.) costatum*, *S. (Eu.) latipes* (Meigen 1804), *S. (Eu.) lundstromi*, *S. (Eu.) vernum* Macquart 1826, *S. (Wilhelmia) equinum*, *S. (Boophthora) erythrocephalum*, *S. (Odagmia) ornatum* and *S. (Simulium) argyreatum*. The nearby *S. austeni* and *S. morsitans* sites listed by Davies (1968) were visited but these species were not found.

Blackflies were often recorded as absent from the very upper reaches of streams, but this was usually due to the stream being dry when visited. Also they do not usually occur in the lower reaches which are large and slow enough to be navigable by boats other than canoes.

S. latipes — was found in a single Norfolk stream, draining a pond, and which, according to local residents, tended to dry up in summer. This is considered the typical habitat by Davies (1966, 1968) and Zwick (1978), who also record the species as probably univoltine. The Norfolk specimens were taken in April.

S. vernum — In lowland Britain this species is typical of small often woodland streams. There seems to be a single large Spring generation in Britain, with small numbers of flies being found later in the year (Davies 1966, Ladle and Esmat 1973). However, Carlsson (1962) and Zwick (1974) report three distinct generations per year from Europe. *S. vernum* was found at only six sites in Norfolk, although it seems likely that more effort put into springtime sampling would reveal it to be rather more common. The samples only gave evidence for a spring generation, and at many sites, which ran dry in summer, further generations would not be possible.

S. costatum and *S. angustitarse* — were collected in the summer, suggesting multivoltinism, as recorded by Zwick (1974). These species are typical of springs and small streams (Davies 1966, Zwick 1978) and in Norfolk were taken together from one spring, and *S. angustitarse* also from one other site, a small stream.

S. angustipes — was taken at all times of the year and was found widely distributed throughout the river system. This description essentially agrees with Davies (1966).

S. lundstromi — was taken throughout the year, suggesting multivoltinism, and shows a tendancy to occur in the middle reaches, not as far downstream as *S. erythrocephalum* and *S. equinum*.

S. equinum — was found throughout the year and tends to occur more downstream in the larger rivers, as is recorded by Davies (1966). See Table 1.

S. erythrocephalum — has five generations per year at Carlton Forehoe, on the River Tiffey (Post 1979). There is a marked tendency to inhabit lower parts of the river system than other species, but it is often associated with

S. lundstromi although, surprisingly, not with *S. equinum*. Observations at the Norfolk sites suggest that both *S. erythrocephalum* and *S. lundstromi* prefer a relatively more constant laminar flow than *S. equinum*. The tendency for *S. erythrocephalum* to inhabit the river further downstream than *S. equinum* has been noted previously by Ladle *et al* (1977), Hansford (1978) and Zwick (1974).

S. argyreatum—is typical of lake outflow and weirs at any altitude (Davies 1966, Zwick 1978), but it is not always associated with such habitats (Hansford 1978, Davies 1966). Several of the 12 Norfolk sites were not associated with weirs or lakes, but these were typified by a relatively fast and turbulent flow. Found throughout the year.

S. ornatum — is a very common species in Britain and occurs along the entire length of the river, although a tendency to inhabit the more turbulent stretches was noted. This species is multivoltine.

In Norfolk there is a tendency for communities of blackflies to contain more species further down stream. This pattern was also noted by Ladle *et al* (1977) and Hansford (1978) in another part of lowland Britain. However, it is contrary to that found in river systems arising in more mountainous regions (Zwick 1974, Crosskey 1973).

Discussion

The species found in Norfolk are those characteristic of lowland N.W. Europe, although the apparent absence of *S. lineatum* (Meigen; 1804) is perhaps surprising. Furthermore, the distribution of individual species seems to conform well with that described in other studies.

We have noted that some species have a preference for certain defined types of habitat, *S. argyreatum* usually occurs in faster flowing more turbulent waters, particularly at weirs or lake outlets. *S. erythrocephalum* and *S. lundstromi* seem to prefer a relatively constant laminar flow. However, the most striking feature of the distribution data is the zonation of species along the river. *S. vernum* usually occurs near the source, whereas further downstream we find *S. lundstromi*, then *S. equinum* and S. erythrocephalum. *S. angustipes* and *S. ornatum* seem to occur throughout the river system, but we have already noted that the latter 'species' in reality exists as two sibling species, in Norfolk, whose distributions are, as yet, quite unkown.

The causes of zonation are not fully understood, although speed of current and temperature have been implicated elsewhere (see Hynes 1969).

Acknowledgements

This work was carried out under the supervision of Dr G. M. Hewitt, with the support of the National Environment Research Council. I should also like to thank Dr R. W. Crosskey of the British Museum (Natural History) who collected and identified the 12 samples taken during 1975. R. M. Post and C. Kowal helped prepare the manuscript.

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Table 1 *Zonation of Norfolk rivers by Blackflies*

Species	Number of sites recorded	Mean distance from source (Km)	Standard deviation
any species*	73	11.3	10.3
S. angustipes	42	10.7	8.7
S. angustitarse	2	1.2	—
S. costatum	1	0.6	—
S. latipes	1	4.6	—
S. lundstromi	19	12.9	5.7
S. vernum	6	3.7	3.4
S. equinum	15	18.9	10.2
S. erythrocephalum	22	21.4	11.8
S. ornatum	51	10.5	7.4
S. argyreatum	13	10.4	7.2

*These data are not normally distributed. The 73 sites have a coefficient of skewness of + 1.76 and a kuttosis ratio of 6.51.

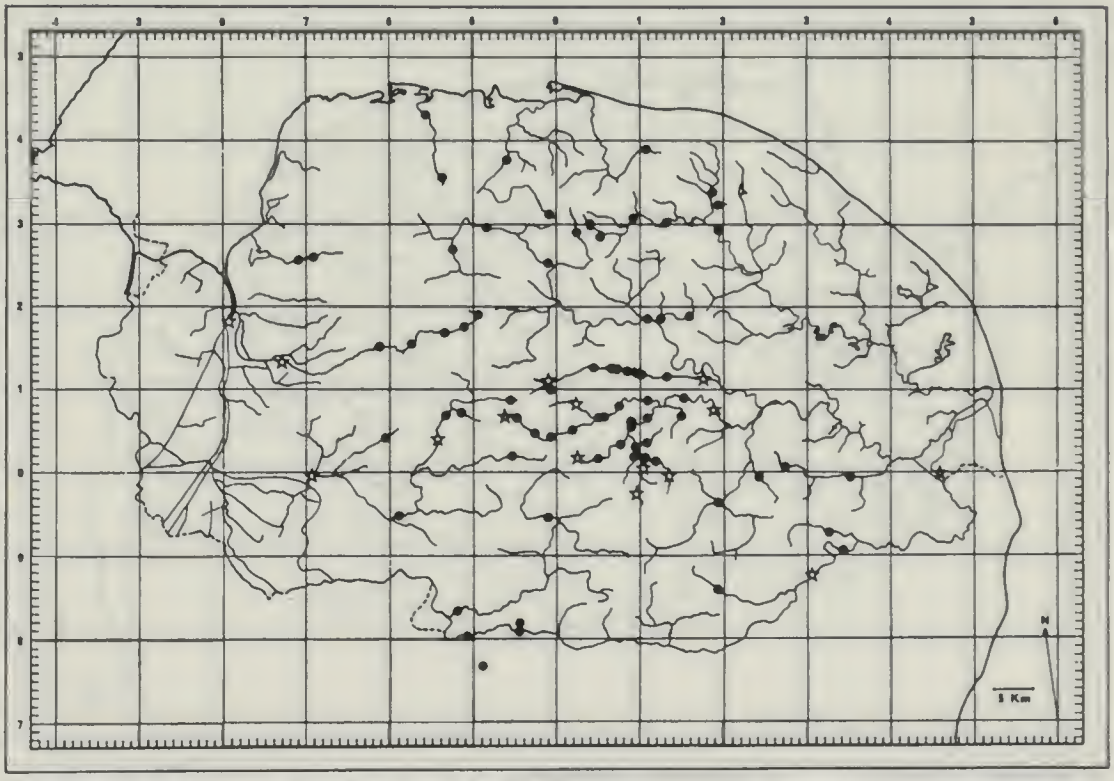
Appendix *Sample data*

S.angustipes = ang. S.angustitarse = ant. S.costatum = cos. S.latipes = lat. S.lundstromi = lun. S.vernum = ver. S.equinum = equ. S.erythrocephalum = ery. S.ornatum = orn. S.argyreatum = arg.

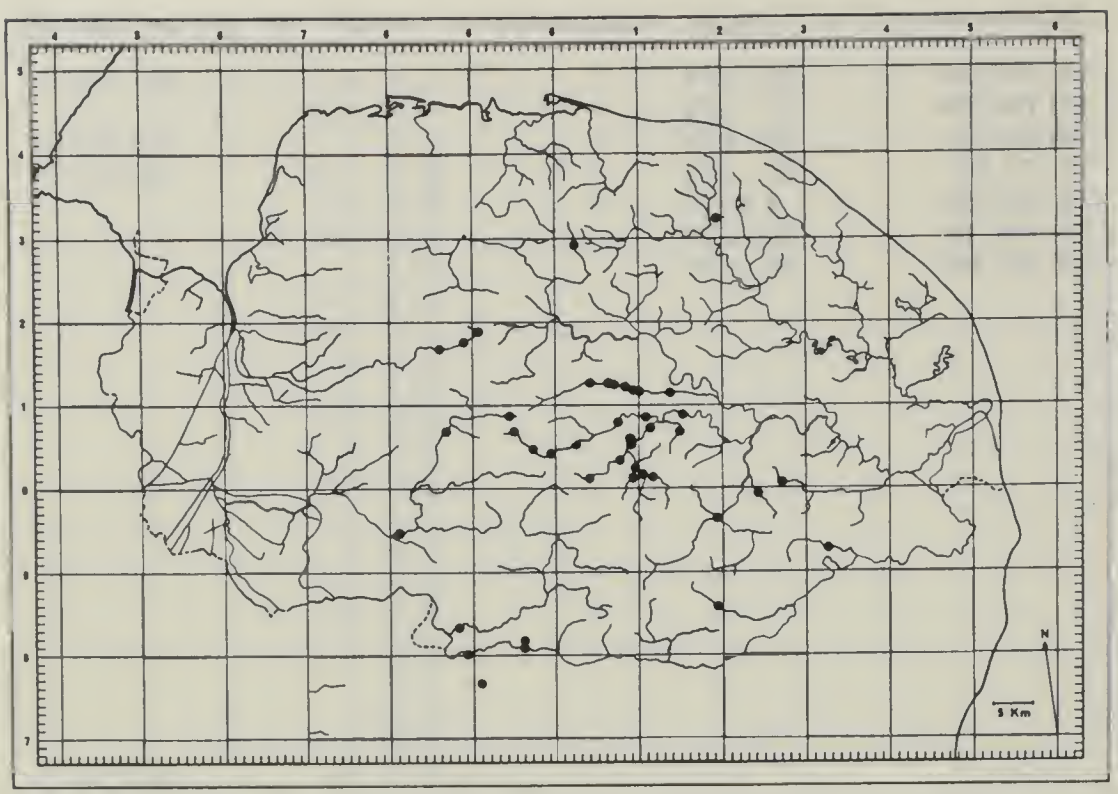
Grid reference	*Date*	*ang*	*ant*	*cos*	*lat*	*lun*	*ver*	*equ*	*ery*	*orn*	*arg*
TF 695 257	22.11.76					*				*	
TF 711 259	22.11.76										
TF 789 151	29.9.75										
TF 973 041	23.4.79										
TH 808 944	23. 4.79	*				*		*	*	*	
TF 828 154	14. 3.77					*		*		*	
	22.11.76					*				*	
TF 842 428	7. 6.79									*	
TF 861 357	7. 6.79									*	
TF 860 170	29. 9.75	*						*		*	
TF 865 067	23. 4.79	*								*	
TF 873 268	29. 9.75									*	
TF 888 175	29. 9.75	*								*	
TL 879 829	23. 6.77								*		
	6.11.77	*									
TF 886 068	23. 4.79						*				
TL 893 802	23. 6.77	*				*			*	*	
TF 906 188	29. 9.75	*	*							*	
TL 911 765	13. 7.78	*						*	*	*	
TF 914 296	7. 6.79							*		*	
TF 942 377	7. 6.79							*		*	
TF 942 087	23. 4.79	*					*				
TF 951 067	23. 4.79	*					*			*	
TF 950 021	23. 4.79				*		*			*	
TL 955 810	6.11.77	*									
TL 955 807	6.11.77	*							*		
TF 971 049	30. 7.76	*								*	
TL 992 946	29. 9.75									*	
TF 992 101	19. 8.76		*	*							
TF 994 312	7. 6.79									*	
TF 997 251	29. 9.75								*		
TF 999 044	30. 7.76	*								*	
TG 023 050	2. 8.76	*							*	*	
	10.11.76								*	*	
	4.11.77								*		*
TG 023 296	7. 6.79	*								*	
TG 038 300	7. 6.79						*			*	
TG 041 129	26. 8.76	*								*	
TG 051 015	9. 8.76	*									
TG 048 062	3. 8.76								*	*	
TG 049 062	3. 8.76					*			*		
TG 055 283	7. 6.79										
TG 066 128	31. 8.76	*				*					
TG 067 128	19. 8.76	*				*				*	
TG 076 076	3. 8.76	*							*		*
TG 077 031	10. 8.76	*				*					

Grid Reference	*Date*	*ang*	*ant*	*cos*	*lat*	*lun*	*ver*	*equ*	*ery*	*orn*	*arg*
TG 087 122	21. 7.77	*				*		*		*	
	30. 9.77	*							*	*	
TG 089 302	7. 6.79									*	
TG 092 053	27. 3.78								*	*	
	10. 4.78					*	*		*	*	
	25. .4.78	*				*			*	*	*
	5. 5.78								*	*	*
	17. 5.78	*						*		*	*
	29. 5.78							*	*	*	*
	9. 6.78					*			*		*
	20. 6.78	*				*			*		*
	27. 6.78								*		*
	3. 7.78								*		*
	13. 7.78								*		
	26. 7.78	*				*			*	*	*
	8. 8.78	*							*		
	21. 8.78								*		
	30. 8.78								*	*	
	8. 9.78								*		
	21. 9.78								*	*	
	3.10.78								*		
	16.10.78					*			*		
TG 093 055	13. 8.76					*		*	*	*	
	17. 8.77	*							*		
	7. 3.78	*				*			*	*	*
	10. 4.78					*				*	*
TG 097 118	26. 8.76	*								*	*
	7. 3.78					*				*	
TG 098 118	21. 7.78	*				*		*		*	*
	26. 8.76	*								*	*
	7. 3.78									*	
TG 094 027	11. 8.76	*								*	
TG 094 025	11. 8.76	*									
TG 107 389	30. 9.75										*
TG 108 187	29. 6.78							*	*		
	8. 8.78							*	*		
TG 105 015	16. 8.76	*									
TG 108 085	5. 8.76	*				*			*		
TG 101 031	17. 8.76					*				*	
TG 114 065	12. 8.76	*				*			*	*	
TG 115 012	16. 8.76	*									
TG 127 185	29. 6.78					*		*		*	
TG 133 114	27. 8.76	*				*		*	*	*	
	6. 6.78	*						*		*	
TG 132 300	7. 6.79							*		*	
TG 149 067	6. 8.76	*							*		
TG 158 184	29. 6.78									*	
TG 157 087	6. 8.76								*		
	10.11.76	*							*		*
	28.10.77								*	*	
TG 186 337	30. 9.75									*	
TG 192 292	30. 9.75							*	*	*	
TG 193 321	30. 9.75	*									

Grid Reference	*Date*	*ang*	*ant*	*cos*	*lat*	*lun*	*ver*	*equ*	*ery*	*orn*	*arg*
TM 197 968	29. 6.79	*				*			*	*	
TM 194 858	29. 6.79	*								*	
TM 243 994	29. 6.79	*								*	*
TG 271 007	29. 6.79	*								*	*
TM 324 926	5.10.75	*									*
TM 338 901	20. 6.79								*		
TM 362 990	20. 6.79									*	*



All sites sampled ☆Blackfly negative site



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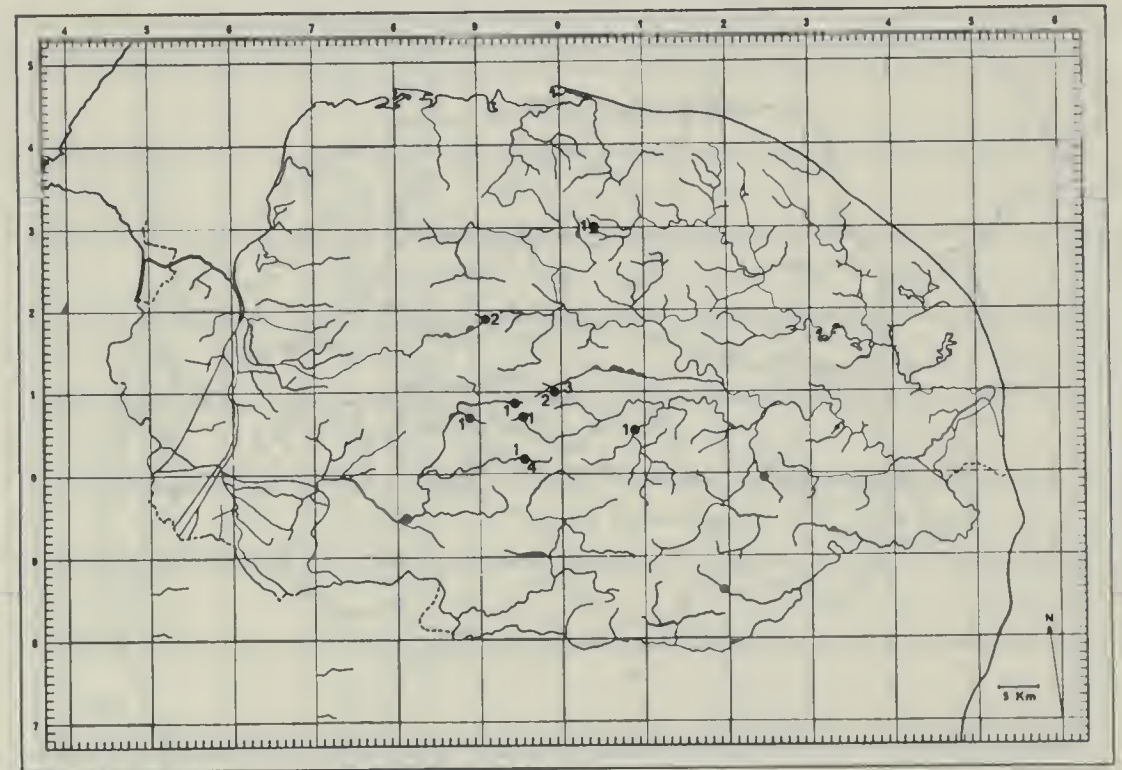
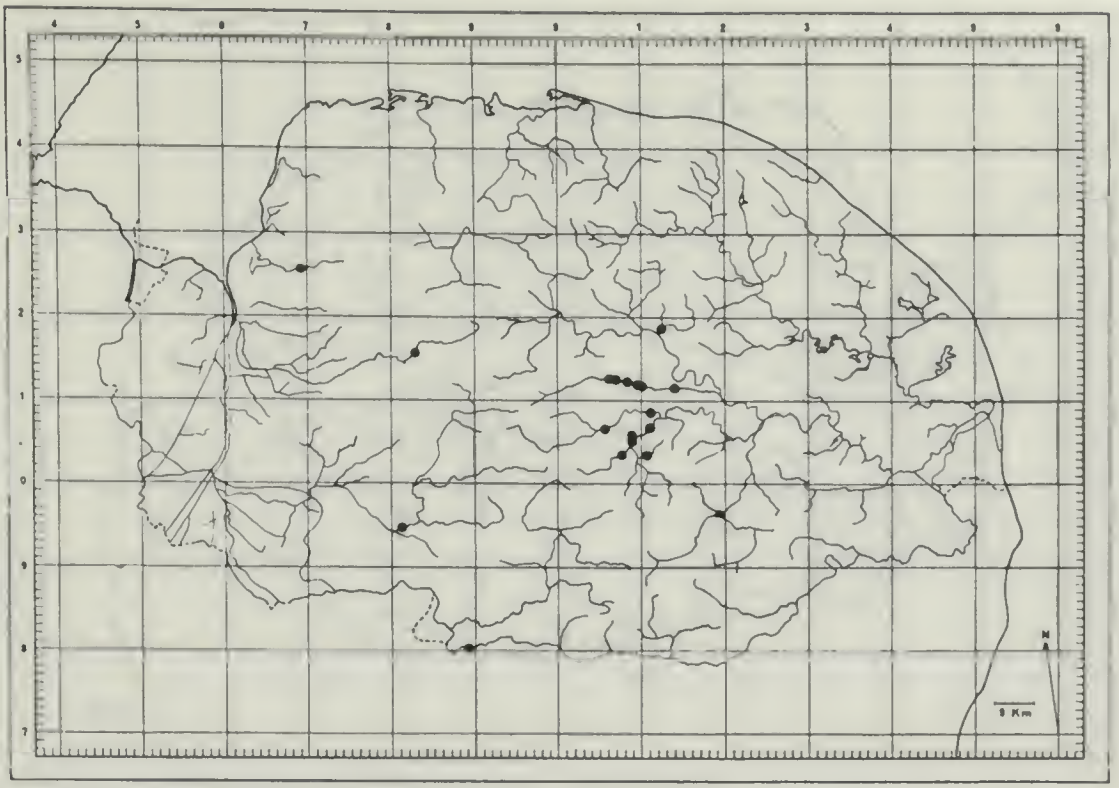
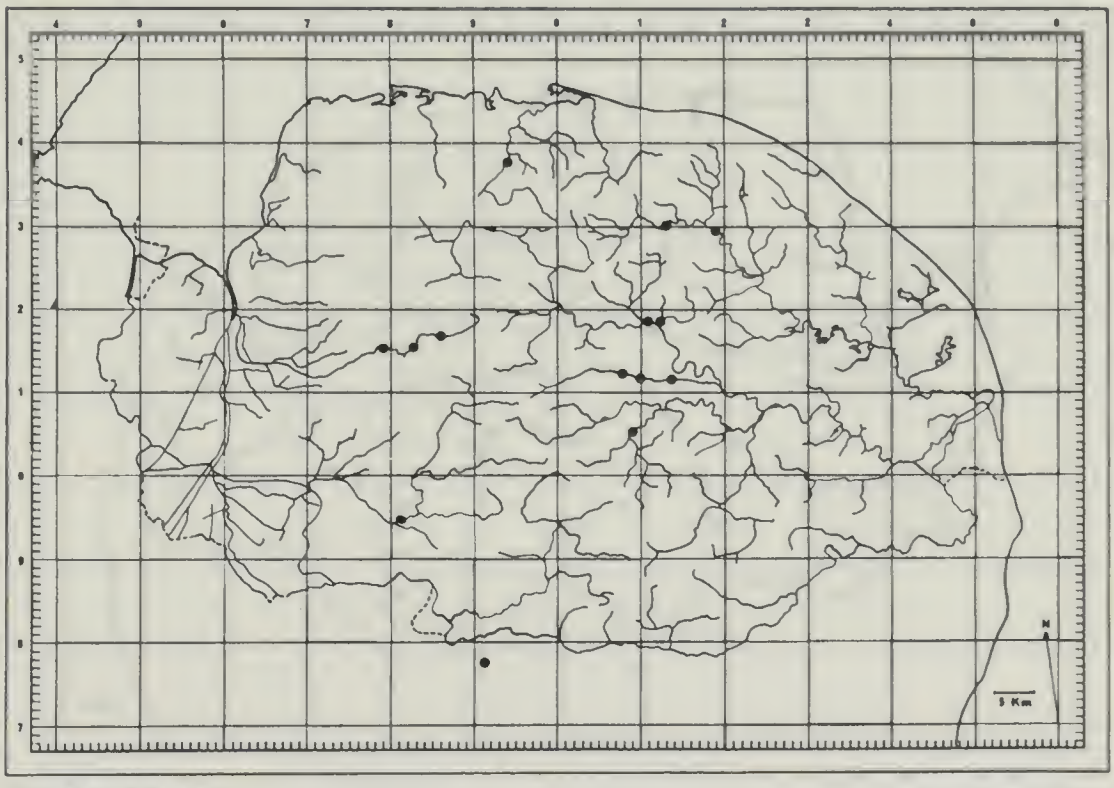


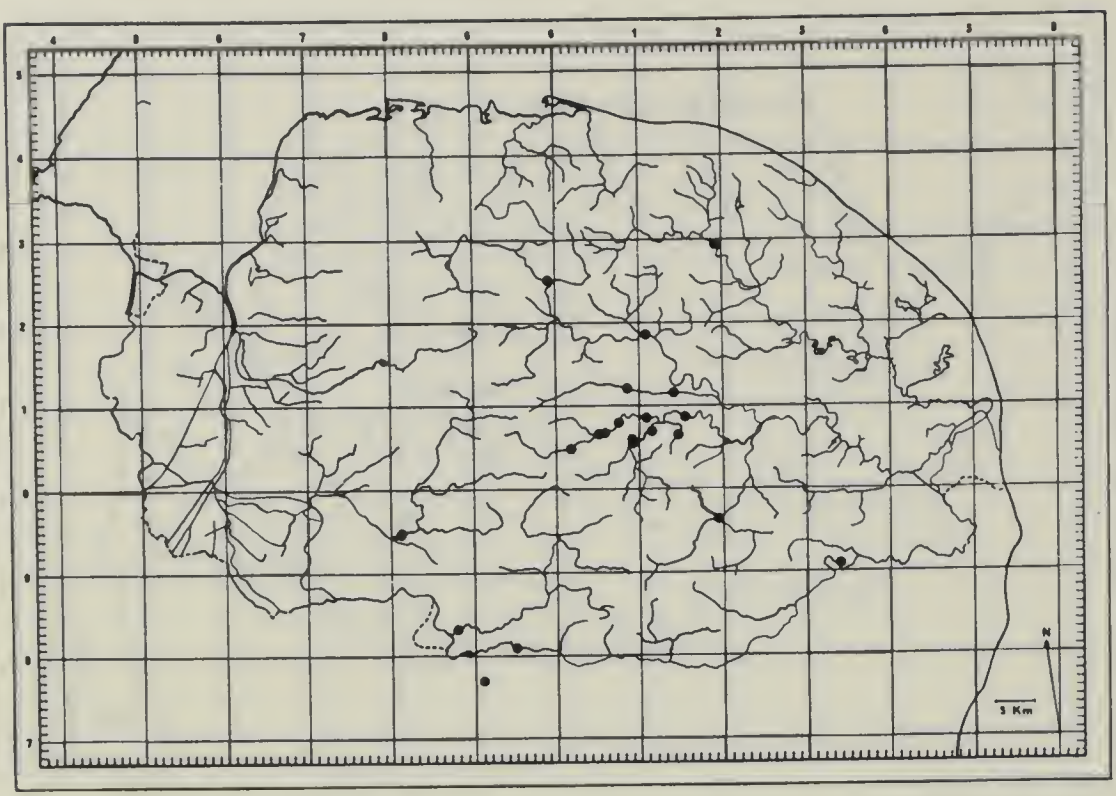
1. Simulium vernum
2. Simulium angustitarse
3. Simulium costatum
4. Simulium latipes



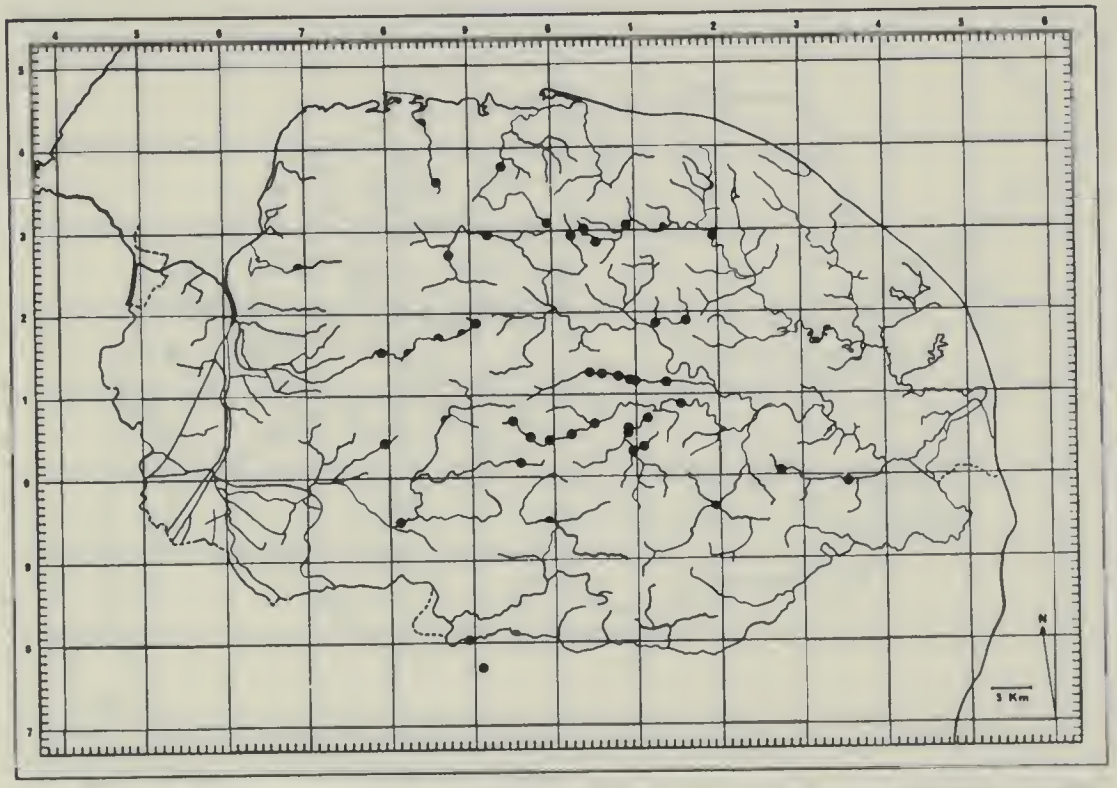
Simulium lundstromi



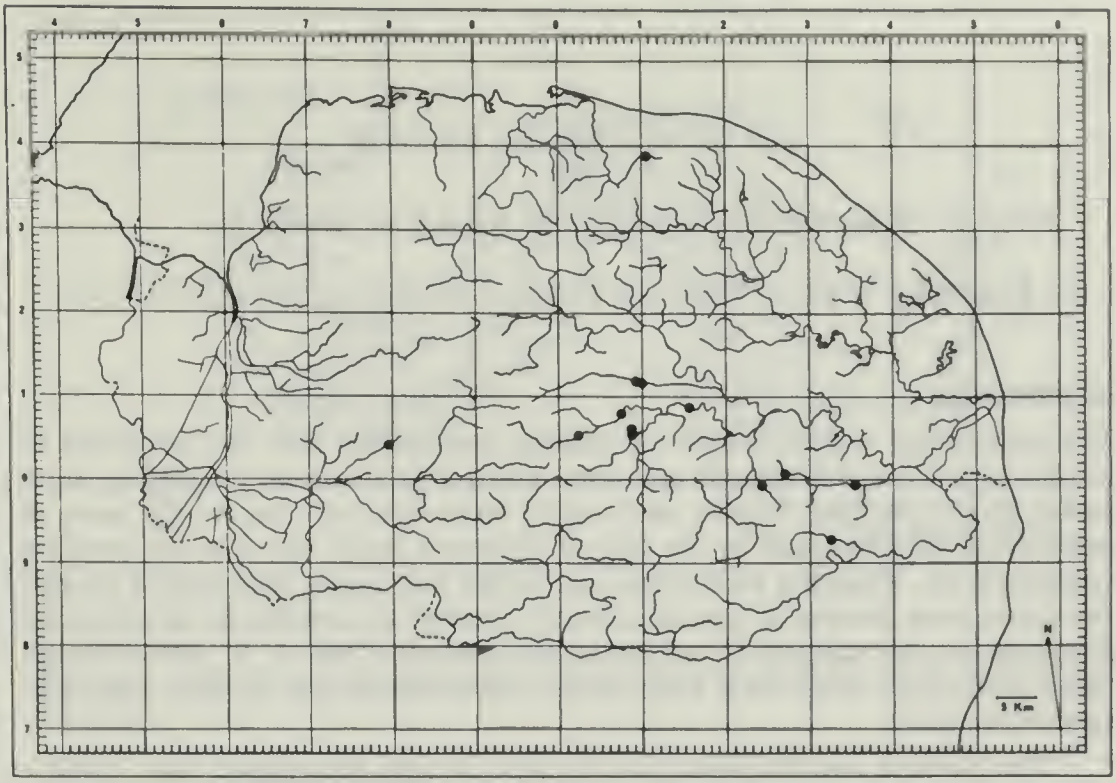
Simulium equinum



Simulium erythrocephalum



Simulium ornatum



Simulium argyreatum

AN ECOLOGICAL REVIEW OF THE WENSUM VALLEY NEAR NORWICH

by Geoffrey Watts, Michael Baker, Alec Bull, Ernest Daniels

Introduction

The population of East Anglia is steadily increasing, and the pressures of human activity upon natural and semi-natural habitats are becoming more and more destructive. This is particularly so in habitats close to the areas of population growth, such as the city of Norwich itself, but also its satellite communities. Planning authorities are under increasing pressure to permit the conversion of areas of special scientific interest for residential or industrial development, for mineral extraction or for recreation (refs. 1, 2), and although these authorities often seek wide public consultation (ref. 3) they also need specialist advice.

The Norfolk and Norwich Naturalists' Society recognised that it had a role to play in surveying areas of the countryside that seemed particularly at risk, and in attempting to identify ecologically significant sections for the guidance of both planners and public. In 1970 the Society set up the Yare Valley Survey Sub-Committee which reviewed the Yare Valley near Norwich from Bawburgh Mill to Whitlingham Marshes, publishing its finds in the Society Transactions in 1975 (ref. 4). This paper was well received and, with the prompting of both the Norfolk Society and the Norwich Society, the Society set up another working party to undertake a similar survey of the Wensum Valley near Norwich.

The Wensum Valley Survey Sub-Committee first met on December 9th, 1976, to decide upon the scope and methods of the investigation, and it was agreed that as far as possible the work should follow the pattern of the Yare Valley Survey. Thus, although information about valley sites would be widely sought, the survey would be carried out by a small group of people visiting all parts of the area and judging each section by an agreed set of criteria.

Methods

It was agreed to survey the land immediately adjacent to the River Wensum in a band extending from Ringland Bridge (TG 141137) to Mile Cross Road Bridge (TG 217099) in Norwich. The survey area was divided into 38 sections, each consisting of between a half and one kilometre of river bank in length and between a quarter and a half of a kilometre in width of valley floor and slopes on one side of the river. The sections were named and numbered to facilitate identification and description,and their boundaries are plotted on the accompanying maps. (Figs. 1 and 2).

FIGURE 1—The position and extent of the survey sections from Ringland to Drayton.

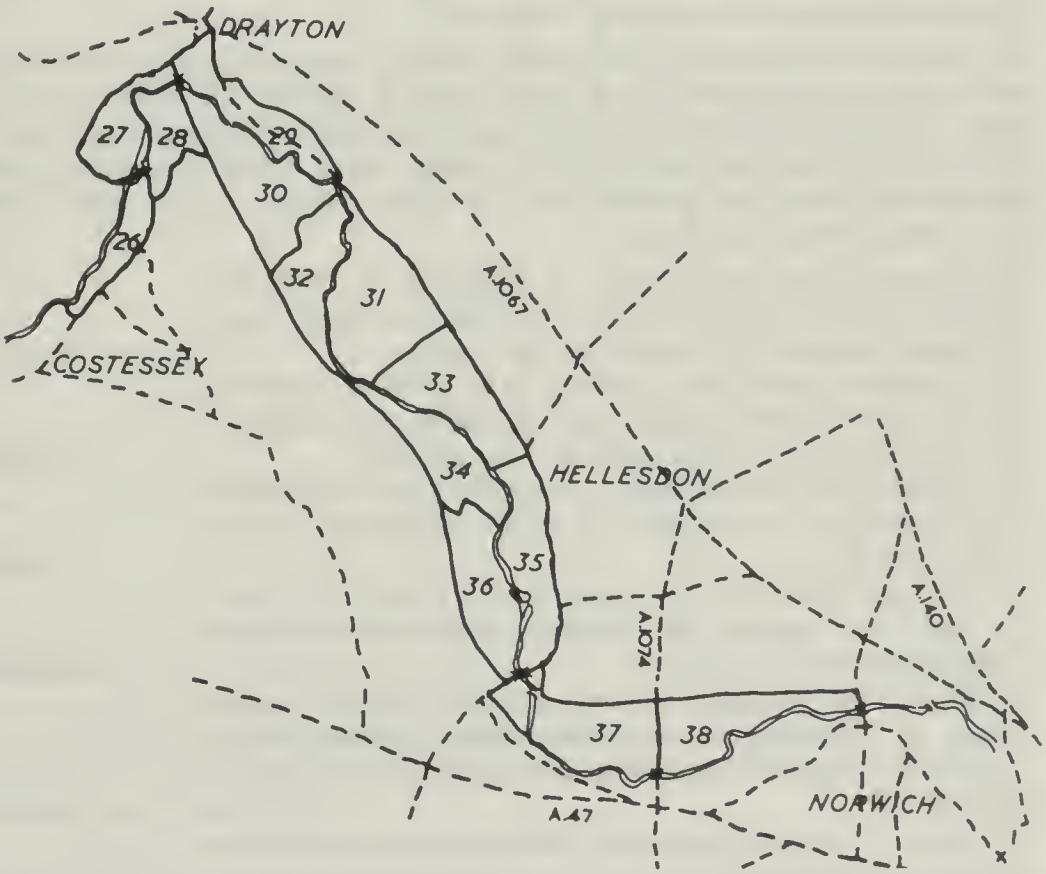


FIGURE 2—The position and extent of the survey sections from Drayton to Norwich.

Attempts were made to identify the owners of the land to be surveyed by general or local enquiries. Landowners were approached by letter or in person, and in the majority of cases permission to visit the sites and make the survey was ungrudgingly given. Fieldwork was carried out during the spring and summer months of 1977, 1978 and 1979. The survey group met at intervals of about a fortnight, and during an afternoon's and evening's work covered one of two sections, as follows:

1977 — April 20th (Section 7); May 25th (2,4); June 8th (1,3); June 22nd (5,6); July 6th (9); July 27th (8,10); August 10th (11, 13); August 24th (14); September 7th (16).
1978 — April 19th (12); May 3rd (15); May 17th (17,19,21); May 31st (23, 25); June 14th (20); June 28th (18); July 12th (22); July 26th (24, 26); August 9th (27,28); August 23rd (29); September 6th (30).
1979 — May 2nd (32); May 16th (31,33); May 30th (34,36); June 13th (35); June 27th (37); July 11th (38).

In general the sections were visited in sequence downstream. The group was aware of the possibility of bias arising from different sections being visited at different times of the year, and attempted to compensate for this in the assessments. Additional data was derived from extra visits made to particular sections by individual members of the group; from the excursions to the area arranged by the Society; and from individuals responding to a general request published in the Society's Bulletin.

As with the previous Yare Valley Survey, one of the chief aims was to arrive at a comparative view of the significance of the many habitats in the river valley. This was attempted by converting an essentially subjective exercise into as objective a study as possible by the adoption of criteria for judging each section which had been devised for the previous survey. This was an eleven-point scale divided as follows:

(a) PRESENCE OF SCARCE SPECIES — points to be given for plant or animal species which are either nationally rare, or scarce within the Wensum valley system	10 points
(b) DIVERSITY OF SPECIES — points to be given in relation to the total number of plant and animal species present, as some measure of the richness of the section	10 points
(c) PRESENCE OF SCARCE HABITATS — points to be given for types of habitats in sections which are uncommon in the valley system	5 points
(d) DIVERSITY OF HABITATS — points to be given in relation to the total number of different habitats within the limited area of the section	10 points
(e) QUALITY OF HIGHER PLANTS — points to be given for the array of flowering plants in the section; for their ecological significance, their botanical interest, their special appeal	20 points
(f) QUALITY OF LOWER PLANTS — as (e) but in relation to flowerless plants	5 points
(g) QUALITY OF VERTEBRATES — as (e) but in relation to mammals, birds, reptiles, amphibia and fish	15 points

Table 1 *Showing scaled score ratings for each section*

Section No.	*a* (10)	*b* (10)	*c* (5)	*d* (10)	*e* (20)	*f* (5)	*g* (15)	*h* (10)	*i* (5)	*j* (5)	*k* (5)	*Total* (100)
1	3	5	0	6	9	3	10	5	0	1	2	44
2	3	7	0	7	16	1	11	7	1	1	3	57
3	1	7	2	7	16	1	10	3	0	1	2	50
4	1	5	0	7	11	2	6	3	0	0	2	37
5	3	7	3	9	16	3	10	5	1	1	1	59
6	1	6	2	9	11	2	6	7	2	1	3	50
7	7	10	5	9	8	4	15	8	5	4	5	80
8	0	5	0	7	8	1	6	7	0	1	1	36
9	1	4	0	4	7	1	10	8	0	0	0	35
10	3	5	2	6	12	3	9	7	2	2	4	55
11	1	7	0	6	15	3	10	8	2	2	3	57
12	3	9	0	9	16	3	11	7	2	2	2	64
13	0	4	0	6	9	1	6	5	0	1	1	33
14	1	9	2	7	11	3	11	8	5	5	5	67
15	3	6	0	7	13	3	11	8	2	2	2	57
16	3	9	2	7	11	2	11	10	2	2	3	62
17	1	2	0	5	7	1	6	3	1	1	2	29
18	3	10	2	9	19	3	15	10	5	4	5	85
19	0	4	0	4	8	2	6	5	1	0	1	31
20	4	10	3	10	20	3	15	8	5	2	5	85
21	4	6	2	7	11	2	6	7	1	0	1	47
22	7	10	3	7	20	4	12	10	5	5	2	85
23	3	5	0	6	8	1	9	7	1	0	1	41
24	0	2	0	4	8	1	7	5	0	0	1	28
25	3	6	0	7	11	1	11	7	1	1	1	49
26	3	5	2	7	7	1	7	7	0	0	1	40
27	1	6	0	6	12	1	7	8	1	1	2	45
28	0	6	0	6	12	1	7	8	0	1	2	43
29	10	7	2	7	19	2	9	7	0	1	2	66
30	9	7	2	7	16	1	7	8	1	1	3	62
31	1	5	2	7	11	3	9	7	0	1	2	48
32	3	7	2	9	17	5	10	7	4	4	3	71
33	3	4	2	6	8	3	7	5	0	0	1	39
34	3	7	2	9	15	3	9	8	2	2	2	62
35	3	9	2	7	15	1	11	7	1	2	4	62
36	3	7	2	7	13	2	11	7	1	1	3	57
37	9	9	2	10	17	3	9	10	2	2	3	76
38	10	9	2	10	17	3	11	8	2	4	3	79

(h) QUALITY OF INVERTEBRATES — as (e) but in relation to invertebrates, particularly insects ... ... 10 points

(i) VALUE FOR RESEARCH — points to be given for areas of ecological significance having reasonable access but with limited public pressures offering good opportunities for investigative fieldwork ... ... 5 points

(j) VALUE FOR EDUCATION — points to be given for areas accessible to school parties, likely to be biologically productive without being unduly hazardous, and facilitating environmental approaches to education ... ... 5 points

(k) VALUE FOR AMENITY — points to be given for areas of natural charm or beauty, or areas that were accessible and appropriate for walking, angling, etc., or areas of lesser value that might be given over to more disruptive outdoor pleasures and amusements	5 points
Total	100 points

The criteria are more fully discussed in the Yare Valley Survey paper (ref.4). The plant and animal life of the river itself was not included in the survey, although work on this has been carried out by Society members (refs. 5,6).

The Area Reviewed The nomenclature of the vascular plants follows that in *The Flora of the British Isles* by Clapham, Tutin and Warburg, *2nd edition, 1962.*

SECTION ONE — RINGLAND BRIDGE EAST: Small area of rough marsh; otherwise mostly grazed pasture next to river and arable fields away from it. *Impatiens glandulifera, Carex vesicaria, Bryum pseudotriquetrum,* and *Pohlia delicatula* notable. Grade 5.

SECTION TWO — RINGLAND BRIDGE WEST: Area between road and river, ranging from managed grazed pasture to rough marsh, heavily dissected by drains. Small poplar plantation. *Carex elata, Thalictrum flavum,* sedge warblers, reed bunting, yellow wagtail notable. Grade 3.

SECTION THREE — THREE CORNER PLANTATION NORTH: Area of grazed pasture, part intensively managed, part with dicotyledons. Drains with diverse marginals. Old woodland fringe of oak/hazel coppice. Poplar plantation. *Oenanthe fluviatilis, Carex vesicaria* notable. Grade 4.

SECTION FOUR — AVES GAP FIELDS: Area of grazed pasture between road and river, with some rough marsh, scrub and drains. Poplar plantation. Arable fields beyond road. *Amsinckia intermedia* notable. Grade 5.

SECTION FIVE — THREE CORNER PLANTATION SOUTH: Grazed pasture adjacent to river. Drains with marginals. Marsh. Willow scrub. Old woodland fringe. Poplar plantation. Damp heath. *Corydalis claviculata, Thalictrum flavum* notable. Grade 3.

SECTION SIX — RINGLAND HILLS FIELDS: Area from Ringland Hills down to river. Birch/oak woodland and heath on Hills. Arable fields. Rough marsh, blackthorn scrub and poplar plantation between road and river. *Amsinckia intermedia,* woodcock notable. Grade 4.

SECTION SEVEN — RINGLAND LAKES: Old, recolonised gravel workings—complex of pools and heaps. Wide range of habitats including rough marsh, scrub, wood, damp heath, dry heath. Wide range of species, notably *Prunus padus, Primula vulgaris,* otter, gadwall, grasshopper warbler, siskin, nightingale. Grade 1.

SECTION EIGHT — COBB'S HILLS FIELDS: Area from Cobb's Hills down to river. Beech/pine woodland. Arable field. Between road and river, mixed plantation, scrub, rough marsh. Grade 5.

Table 2 *Showing scaled score and grade for each section*

Section No.	*Name*	*Scaled Score*	*Grade*
1	Ringland Bridge East	44	5
2	Ringland Bridge West	57	3
3	Three Corner Plantation North	50	4
4	Aves Gap Fields	37	5
5	Three Corner Plantation South	59	3
6	Ringland Hills Fields	50	4
7	Ringland Lakes	80	1
8	Cobb's Hills Fields	36	5
9	The Carrs	35	5
10	Blackhill Wood	55	3
11	Blyth's Wood	57	3
12	Beechcroft Fields	64	3
13	Taverham Hall Fields	33	6
14	Taverham Lakes West	67	2
15	Taverham Mill	57	3
16	Taverham Lakes East	62	3
17	Taverham Church Farm	29	6
18	Costessey Pits	85	1
19	Place Farm North	31	6
20	Costessey Common	85	1
21	Place Farm Central	47	4
22	Costessey Falcon	85	1
23	Place Farm South	41	5
24	Costessey Street South	28	6
25	Paradise Plantation	49	4
26	Costessey Street North	40	5
27	Costessey Mill West	45	4
28	Costessey Mill East	43	5
29	Drayton Bloods Dale	66	2
30	Bridge Cottage Marsh	62	3
31	Wensum Mount North	48	4
32	Wensum View Marsh	71	2
33	Wensum Mount South	39	5
34	Red Bridge Lane Marsh	62	3
35	Hellesdon Mill	62	3
36	Hellesdon Fish Farm	57	3
37	Hellesdon Road to Sweet Briar Road	76	1
38	Sweet Briar Road to Mile Cross Road	79	1

Section Nine — The Carrs: Area mainly of rough marsh with some alder/willow scrub. Poplar plantation. Grazed pasture. *Salix pentandra, Thalictrum flavum*, kingfisher notable. Grade 5.

Section Ten — Blackhill Wood: Mostly mature woodland (ash, beech, hazel, oak, sycamore). Grazed pasture. Riverside plots with mown grass, gardens, shrubs. *Rubus raduloides, Lysimachia nemorum, Corydalis claviculata, Centaurea erythraea, Dryopteris filix-mas, D. dilatata, D. carthusiana* notable. Grade 3.

Section Eleven — Blyth's Wood: Riverside grazed pasture. Large mature wood (elm, alder, sweet chestnut, birch, sycamore, ash, hawthorn, white willow, holly). Ponds in wood. Rough marsh. Drain with marginals. Wide riparian fringe. *Dryopteris filix-mas, D. dilatata, Catabrosa aquatica* notable. Grade 3.

Section Twelve — Beechcroft Fields: Dry woodland fringe away from river. Wet woodland (mostly willow) near river. Grazed pasture. Arable fields. Reed bed. *Leskea polycarpa*, green woodpecker, kingfisher notable. Grade 3.

Section Thirteen — Taverham Hall Fields: Parkland and arable field away from river. Poplar plantation and willow plantation near river. Small ash wood. Small oak wood. Grade 6.

Section Fourteen — Taverham Lakes West: Large flooded gravel workings with two islands. Wet wood (alder, hawthorn, birch, willow, oak, spruce, poplar). Grazed pasture. Ungrazed rough grassland. *Nymphoides peltata*, little grebe, great crested grebe, heron notable. Grade 2.

Section Fifteen — Taverham Mill: Mixed woodland (beech, oak, cherry, cypress, sycamore, ash) and (oak, pine, sycamore, horse chestnut). Playing field. Parkland (oaks and rough grass). Small pine plantation. Small fir plantation. Gardens. Ruderal. *Phyllitis scolopendrium*, *Veronica filiformis*, *Eurhynchium riparioides*, rookery of 81 nests, nesting grey wagtail notable. Grade 3.

Section Sixteen — Taverham Lakes East: Large flooded gravel workings. Plantation of pine, poplar and rhododendron surrounding. Rough marsh. Poplar plantation. Nursery. *Nymphoides peltata*, *Salix pentandra*, *Impatiens glandulifera*, *Carex muricata*, kingfisher, pochard, little grebe, heron notable. Grade 3.

Section Seventeen — Taverham Church Farm: Area between road and river. Grazed pasture along river edge. Churchyard, gardens, playing field and arable field away from river. *Barbarea intermedia*, *Butomus umbellatus* notable. Grade 6.

Section Eighteen — Costessey Pits: Large flooded gravel workings. Wide range of habitats including large water area used for water skiing and sailing, small pools, recolonised heaps, rough marsh, poplar plantation, arable field, grazed pasture. Wide range of species including *Baldellia ranunculoides*, *Carex vesicaria*, *Dactylorchis incarnata*, *Rosa rubiginosa*, great crested grebe, shag. Grade 1.

Section Nineteen — Place Farm North: Mostly arable. Some grazed pasture. *Myosotis ramosissima*, *Saxifraga granulata* notable. Grade 6.

Section Twenty — Costessey Common: Old recolonised gravel workings with large and small pools and heaps. Marsh. Carr. Rough pasture. Scrub. *Potentilla palustris*, *Dactylorchis praetermissa*, *Butomus umbellatus*, *Carex acuta*, *C. vesicaria*, *Dryopteris filix-mas*, *D. dilatata*, *Bryum pseudotriquetrum*, great crested grebe, blue-headed wagtail notable. Grade 1.

Section Twenty-one — Place Farm Central: Mostly arable. Some grazed pasture. Part of a young (12-15 yrs) pine plantation. *Aira praecox*, *Carex caryophyllea*, *Cerastium arvense* notable because scarce in valley. Grade 4.

Section Twenty-two — Costessey Falcon: Grazed pasture. Dry grass heath. Scrub. Mixed woodland. Calcareous fen. Allotments and gardens. *Thalictrum flavum*, *Anagallis tenella*, *Impatiens glandulifera*, *Triglochin palustris*, *Carex lepidocarpa*, *C. echinata*, *C. ovalis*, *Dactylorchis praetermissa*, *Dryopteris dilatata*, *Campylium chrysophyllum* notable. Grade 1 because of the wide range of species and of the calcareous fen.

Section Twenty-three — Place Farm South: Grazed pasture. Arable fields. Remainder of pine population from 21. Drains with marginals. *Hottonia*

River, marginal vegitation, grazing pastures and poplars (Sections 3 and 4, south of Ringland).

Rivers and trees (Sections 9 and 10, below Blackhill Wood, between Ringland and Taverham).

In Blackhill Wood (Section 10, between Ringland and taverham)

palustris, Catabrosa aquatica, Barbarea intermedia, Impatiens glandulifera notable. Grade 5.

SECTION TWENTY-FOUR — COSTESSEY STREET SOUTH: Some grazed pasture. Mostly gardens down to river — mown or rough grass and scrub. Alder, willows, poplars. *Salix pentandra, Butomus umbellatus, Oenanthe fluviatilis* notable. Grade 6.

SECTION TWENTY-FIVE — PARADISE PLANTATION:Almost entirely grazed pasture. Old plantation now alder and birch. Drains. Chalk spoil heaps in old pits. *Populus nigra, Catabrosa aquatica* notable. Grade 4.

SECTION TWENTY-SIX — COSTESSEY STREET NORTH: Area between road and river. Mostly gardens to river — cultivated, mown or rough grass and scrub. Some grazed pasture. hay meadow. *Amsinckia intermedia, Azolla filiculoides* notable. Grade 5.

SECTION TWENTY-SEVEN — COSTESSEY MILL WEST: Mostly grazed pasture. Drains. Willow carr. Area of rough marsh/swamp with reed. *Hottonia palustris, Scrophularia umbrosa, Amsinckia intermedia,* notable. Grade 4.

SECTION TWENTY-EIGHT — COSTESSEY MILL EAST: Mostly grazed pasture. Some rough marsh. Drains. Wooded railway embankment. *Impatiens glandulifera, Azolla filiculoides* notable. Grade 5.

SECTION TWENTY-NINE — DRAYTON BLOODS DALE: Mostly grazed pasture. Drains. Tree-lined green lane. *Origanum vulgare, Nepeta cataria, Calamintha ascendens, Acinos arvensis, Calystegia sepium ssp. pulchra, Scrophularia umbrosa, Tilia cordata, Pimpinella saxifraga, Medicago x varia, Hieracium perpropinquum, Azolla filiculoides* notable. Grade 2 particularly because of higher plants.

SECTION THIRTY — BRIDGE COTTAGE MARSH: Mostly grazed pasture. Glyceria meadows. Rough marsh. Drains. Pond. Wood (oak, alder, elm, ash). Arable fields. *Verbena officinalis, Inula conyza, Verbascum pulverulentum, Acinos arvensis, Carex muricata, Hydrocharis morsus-ranae, Hottonia palustris,* dabchick, green sandpiper, kingfisher, teal, four butterfly spp., three bumble bee spp. notable. Grade 3.

SECTION THIRTY-ONE — WENSUM MOUNT NORTH: Mostly arable fields. Grazed pasture along river and away from river. Escarpment. Small mature beech-wood. Drains with marginals. Alder carr. *Montia perfoliata* notable. Grade 4.

SECTION THIRTY-TWO — WENSUM VIEW MARSH: Mostly grazed pasture. Arable field. Alder/willow carr. Chalk-based grazing marsh. Small wood (oak, beech, hawthorn). *Amblystegium kochii, Bryum pallens* notable. Grade 2.

SECTION THIRTY-THREE — WENSUM MOUNT SOUTH: Mostly arable fields. Grazed pasture. Marsh. Drains. Scrapyard. Houses with gardens between road and river. *Prunus cerasus, Bryum bicolor ssp. gracilentum* notable. Grade 5.

SECTION THIRTY-FOUR — RED BRIDGE LANE MARSH: Mostly grazed pasture. Arable field. Drains. Ponds. Willow carr. *Arabis hirsuta, Helictotrichon pratense, Bartramia pomiformis, Calypogeia fissa* notable. Grade 3.

SECTION THIRTY-FIVE — HELLESDON MILL: Mostly residential with gardens between road and river. Grazed pasture. Rough marsh. Willow plantation. Drains. Ruderal. Mown recreational grass. *Veronica filiformis, Oenothera erythrosepala, Pentaglottis sempervirens, Rubus echinatus, Thalictrum flavum, Dactylorchis incarnata, D. praetermissa, Scrophularia umbrosa, Hottonia palustria,* grey wagtail, lesser spotted woodpecker notable. Grade 3.

Poplar plantation (Section 13, south-west of Taverham)

Recolonised gravel workings at Taverham Pits (Section 14, south of Taverham)

Distribution of Grades

Grade 1 sections	6
Grade 2 sections	3
Grade 3 sections	11
Grade 4 sections	6
Grade 5 sections	8
Grade 6 sections	4

Section Thirty-six — Hellesdon Fish Farm: Mostly grazed pasture. Some unimproved marsh. Drains. Fish pools. Ruderal. *Hottonia palustris, Thalictrum flavum, Menyanthes trifoliata, Inula conyza,* Egyptian goose, grey wagtail, yellow wagtail, heron notable. Grade 3.
Section Thirty-seven — Hellesdon Road to Sweet Briar Road: Rough grazing. Arable fields and abandoned arable. Ponds. Drains. Marsh/swamp. Willow carr. Old railway track. *Bidens tripartita, Triglochin palustris, Rubus plicatus, R. platyacanthus, R. raduloides, Oenanthe fluviatilis, Scrophularia umbrosa, Dactylorchis praetermissa, D. praetermissa x fuchsii, D. traunsteineri, Carex ovalis, C. pseudocyperus,* notable. Grade 1 particularly for the wide range of significant plants and habitats.
Section Thirty-eight — Sweet Briar Road to Mile Cross Road: Mostly marsh, ranging from rough dry grazing to swamp. Drains. Alder carr. Oak wood. Pond. Old railway track. Rubbish tip. *Heracleum mantegazzianum, Hirschfeldia incana, Stellaria palustris, Triglochin palustris, Viburnum rhytidophyllon, Dactylorchis praetermissa, D. traunsteineri, Verbascum pulverulentum, Butomus umbellatus, Oenanthe fluviatilis* notable. Grade 1 for the wide range of significant plants and habitats.

The Habitats Encountered

In each section an attempt was made to record the variety of habitats present, and the distribution of these is shown in Table 3. Some habitats are quite distinct and easily recognised and classified, whereas others are sometimes difficult to attribute to one or another category. This is particularly the case with grassland which, in one form or another, dominated the survey area. Grassland is very responsive to water supply, changes in water levels, cutting or grazing regimes, use of fertilisers or herbicides and frequency of cultivation and reseeding. The range of grassland vegetation in the survey area represents a continuum in which the various habitat categories are artificial, although useful, divisions. The types of habitats recognised were:
(a) Open Water — Although there were no active gravel workings in the survey area, abandoned and recolonised pits dominated the landscape in sections 7, 14, 16, 18 and 20, providing a variety of open water habitats of importance for some plants and birds, and serving leisure needs through angling, sailing, water skiing, etc. The area also included a number of ponds. Since sections adjacent to the river were considered to begin at the river's edge, the open water of the river was not scored.
(b) Drains — Most of the land bordering the river was drained by open channels, many of which were wide and deep. In interest they ranged from the newly excavated and sterile to some with good growths of aquatic macrophytes and marginal plants and having rich invertebrate faunas.
(c) Riparian Fringe — Almost all sections bordered the river and the land-water interface varied from a vertical bank with an abrupt transition, to a rich marsh/swamp interaction with a variety of marginal plants.
(d) Reedswamp — Areas of wetland where the summer water level is at or above soil level. The ground is always waterlogged and the plant community is usually dominated by *Phragmites communis, Glyceria maxima* or *Phalaris arundinacea.*

Table 3 *Habitats in the area surveyed*

Section No.	Habitat (see text for key)																	
	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*	*l*	*m*	*n*	*o*	*p*	*q*	*r*
1		*	*	*	*				*	*				*			*	
2		*	*		*	*	*		*	*				*	*		*	
3		*	*		*			*	*						*	*	*	
4		*	*	*	*				*	*			*	*	*		*	*
5		*	*		*	*			*		*		*		*	*	*	
6		*	*	*	*					*		*	*		*	*	*	
7	*	*		*	*	*					*	*	*			*		*
8		*	*		*					*			*	*	*	*	*	
9		*	*	*	*				*				*		*			
10			*			*	*		*	*			*	*		*		*
11	*	*	*	*	*	*			*				*			*		
12			*	*	*	*	*			*			*	*		*	*	*
13		*	*	*	*				*				*		*	*	*	
14	*	*	*	*	*	*	*		*				*			*		
15		*	*		*	*			*	*			*		*	*	*	*
16	*	*	*	*	*					*			*		*	*		*
17			*				*		*	*				*			*	*
18	*	*	*	*	*	*	*	*		*		*	*		*		*	*
19			*						*					*			*	
20	*	*	*	*	*	*	*		*	*			*	*				*
21			*			*			*	*				*	*		*	*
22		*	*				*	*	*	*		*	*			*		*
23		*	*						*					*	*		*	*
24		*					*		*	*			*	*				*
25		*	*		*		*	*	*	*			*	*				*
26			*			*	*		*	*				*				*
27		*	*	*	*				*	*			*	*				*
28		*	*		*	*	*						*	*				*
29		*	*			*	*		*	*				*				*
30	*	*	*	*	*	*	*		*				*			*	*	*
31		*	*		*	*	*		*	*			*			*	*	
32	*	*	*		*		*		*				*	*		*	*	
33		*	*		*	*	*		*	*			*				*	*
34	*	*	*		*	*	*	*					*	*			*	
35		*	*		*	*	*	*		*			*	*	*			*
36	*	*	*		*	*	*		*					*				*
37	*	*	*	*	*	*	*	*	*	*			*	*			*	
38	*	*	*	*	*	*	*			*			*	*	*	*		*

(e) MARSH — Wetland areas where the summer water level is below soil level, although the soil is mostly waterlogged and liable to winter flooding. In the survey area, usually too wet to graze, and therefore often dominated by coarse vegetation such as *Filipendula ulmaria, Epilobium hirsutum, Iris pseudacorus, Juncus effusus, Caltha palustris, Angelica sylvestris, Conium maculatum, Stachys palustris, Myosoton aquaticum, Urtica dioica.*

(f) GRASSLAND, ROUGH, UNGRAZED — Areas of irregular and rank vegetation, often cut or grazed in the past but now neglected. Range from damp near-marsh areas to dry banks such as disused railways.

(g) Grassland, Rough, Grazed —Areas of lightly or intermittently grazed vegetation, usually with individual or patches of taller plants avoided or ignored by the grazers.
(h) Grassland, Managed, Grazed — Even pastures of desirable grass species, but also rich in dicotyledonous plant species.
(i) Grassland, Intensively Managed — Newly sown or reseeded areas; sprayed with selective herbicides; intensively grazed or mown. Usually no more than two or three species in an even, dark green sward.
(j) Road Verges — Most sections included roads, and many of these were bordered with strips of rough grassland, here considered as a distinct habitat.
(k) Wet Heath — Areas of relatively high soil acidity but where the soil is constantly waterlogged.
(l) Dry Heath — Areas or relatively high soil acidity and which are free draining.
(m) Scrub/Carr — Vegetation dominated by shrubs or small trees, typically hawthorn, blackthorn, hazel or elm in the drier areas, or alder or willow on peat in reedswamp or river margin.
(n) Hedgerow — A line of artificial scrub, ranging from small dense clipped hedges round gardens to large formations often colonised by shrubs and trees.
(o) Plantation — Trees planted and managed for timber production, usually poplar or willow.
(p) Woodland — Communities dominated by trees, usually of several species and either semi-natural or planted.
(q) Arable — Areas of cultivated ground bearing artificial communities dominated by crop plants but with native plants as arable weeds.
(r) Residential and Ruderal — Built-up areas, waste ground, rubbish tips, farmyards, scrapyards.

The Wildlife Value of the Wensum Valley

Following the survey the members of the group were left in no doubt that this stretch of the Wensum Valley is of considerable local importance as a reservoir for wildlife. It contains many sites of some interest, and a few of great significance, but its chief value lies in the variety of habitat types found within a relatively small area. The dominant, but infinitely varied, grasslands blend into marsh and swamp, are dissected by drains and by river, support scrub and abut upon woodland, and are disrupted by gravel workings into a mosaic of pools and heaps. The range of habitats is reflected in a wide range of plant species — probably more than 200 in the total survey area — representing an important reservoir of plant life in an area which is otherwise of diminishing botanical significance. The diversity of habitats and vegetation supports a parallel diversity of animal life.

In those meadows which retain the greatest botanical interest, levels of species diversity are high. In 1971 Dr R. J. Hornby, assisted by members of the Naturalists' Society, compiled a plant species list totalling 146 in section 38 (Sweet Briar Road to Mile Cross Road) during an evening excursion. The list included not only those which were almost ubiquitous in the survey area — *Cerastium vulgatum* (Common Mouse-ear Chickweed), *Cirsium arvense*

Horses grazing rough pasture (Section 18, between Taverham and Costessey).

River, ungrazed and grazed meadows (Sections 20 and 21, between Taverham and Costessey).

(Creeping Thistle), *Cirsium vulgare* (Spear Thistle), *Lolium perenne* (Rye-grass), *Ranunculus repens* (Creeping Buttercup), *Ranunculus acris* (Meadow Buttercup), *Rumex acetosa* (Sorrel), *Trifolium repens* (White Clover) — but many of restricted distribution and characteristic of rather specialised habitats. Species of botanical interest found in this and other sections included:

Angelica sylvestris (Wild Angelica)
Calamagrostis canescens (Purple Smallreed)
Caltha palustris (Marsh Marigold)
Cardamine pratensis (Cuckoo Flower)
Cirsium palustre (Marsh Thistle)
Dactylorchis praetermissa (Fen Orchid)
Dactylorchis incarnata (Meadow Orchid)
Dactylorchis traunsteineri (Narrow-leaved Marsh Orchid)
Epilobium palustre (Marsh Willow-herb)
Filipendula ulmaria (Meadow-sweet)
Galium palustre (Marsh Bedstraw)
Galium uliginosum (Fen Bedstraw)
Geum rivale (Water Avens)
Juncus articulatus (Jointed Rush)
Juncus effusus (Soft Rush)
Juncus inflexus (Hard Rush)
Juncus subnodulosus (Blunt-flowered Rush)
Lathyrus pratensis (Meadow Vetchling)
Lotus uliginosus (Large Birdsfoot-trefoil)
Lychnis flos-cuculi (Ragged Robin)
Lycopus europaeus (Gipsy-wort)
Lythrum salicaria (Purple Loosestrife)
Mentha aquatica (Water Mint)
Menyanthes trifoliata (Bogbean)
Myosotis scorpioides (Water Forget-me-not)
Pedicularis palustris (Marsh Lousewort)
Polygonum amphibium (Amphibious Bistort)
Potentilla erecta (Common Tormentil)
Potentilla palustris (Marsh Cinquefoil)
Ranunculus flammula (Lesser Spearwort)
Rhinanthus minor (Yellow-rattle)
Rumex hydrolapathum (Great Water Dock)
Scutellaria galericulata (Common Skull-cap)
Stachys palustris (Marsh Woundwort)
Succisa pratensis (Devil's-bit Scabious)
Thalictrum flavum (Common Meadow Rue)
Triglochin palustris (Marsh Arrow-grass)
Valeriana dioica (Marsh Valerian)
Veronica beccabunga (Brooklime).

The drains or dykes of the river valley varied greatly in interest, the best of them supporting a wide range of invertebrate life and of plant species, among which were:

Asma plantago-aquatica (Water Plantain)
Azolla filiculoides (Water Fern)
Bidens cernua (Nodding Bur-Marigold)
Ceratophyllum demersum (Hornwort)
Hottonia palustris (Water Violet)
Hydrocharis morsus-ranae (Frog-bit)
Rorippa nasturtium-aquaticum (Water-cress)
Potamogeton perfoliatus (Perfoliate Pondweed)
Sagittaria sagittifolia (Arrow-head)
Sparganium erectum (Bur-reed)
Veronica anagallis-aquatica (Water Speedwell).

During the period of the survey 96 species of bird were recorded in the area reviewed. Breeding was proved — or strong circumstantial evidence obtained — in the case of 43 species. Of the remaining 53 species present during the survey it is thought likely that ten bred. The most favoured section for breeding purposes, having regard to the diversity of habitat, were sections 6, 7, 14, 15, 16, 18 and 20. Among the breeding species recorded in these sections were Great Crested Grebe, Tufted Duck, Lapwing, Kingfisher, Great Spotted Woodpecker, Marsh Tit, Nightingale, Reed Warbler, Sedge Warbler, Grey Wagtail (Taverham Mill) and Redpoll. The meadowland sections also provided a valuable area for nesting and feeding, the breeding birds including Common and Red-legged Partridge, Yellow Wagtail and Lapwing. Of the

River and meadows upstream of railway bridge (Sections 27 and 28, Drayton).

Scrub, drain and associated vegetation (Sections 30 and 32, between Drayton and Hellesdon).

Detail of marsh vegetation (Section 38, near Norwich).

species present during the survey, the most notable among those not proved to have bred were Woodcock, Snipe, Grasshopper Warbler and Lesser Whitethroat. Only eight true passage migrants were observed including Common Sandpiper, Green Sandpiper and Common Tern.

Although the survey period did not include the winter months, certain sections were visited during that season. The meadowland in the area affords rich feeding areas attractive to a large number of birds, particularly when flooded. Snipe, Lapwing, Teal and Mallard are all to be found, together with flocks of Redwings and Fieldfares.

The various gravel pits in the survey area are noteworthy for the various species of duck which visit them in quantity, in particular Mallard, Teal, Pochard and Tufted Duck. A flock of Goldeneye have frequented Taverham Pits in some winters. Cormorants are regularly recorded, and a single Shag was noted, at Costessey Pits. Flocks of Siskin have been recorded and the population of Finches seems to be increasing.

Discussion

The purpose of this review was to survey a significant part of the Wensum Valley and to make a report upon its ecological status in the late 1970's. It is difficult, however, to summarise the state of the wildlife in the valley today without being conscious of the changes which have taken place and are still proceeding. Tansley(ref. 7), writing in 1939, describes riverside pastures (i.e. those regularly grazed) as typically supporting a flora of up to 25 species in fatting pastures and up to 50 species in general purpose pastures, while riverside meadows (i.e. those regularly mown for hay) supported a flora of up to 80 species. Records of vegetation in the Wensum and Yare Valleys near Norwich leave little doubt that many local riverside fields supported such a diversity of plant species until relatively recently. The overwhelming impression gained during this survey is that such flower-rich meadows have been almost completely eliminated. In 28 of the total of 38 sections the survey group encountered intensively managed grassland — even, dark green swards, chiefly of rye grass, *Lolium perenne*, including few herbs other than white clover, *Trifolium repens*. Grazed, managed but herb-rich grassland was encountered in only 7 out of 38 sections, and even then usually in limited areas often away from intensively managed sites.

Some changes in the countryside, such as the felling of trees and the removal of hedgerows, are sufficiently striking to command immediate attention and to provoke comment. The changes in our riverside fields are more obscure and more gradual and — except in a detailed and wide-ranging survey such as this — difficult to quantify. There is no doubt that the advances in agricultural technology and improvements in agricultural financing since the war have offered the means for a more studied and intensive grassland management. Improved machinery provides for more efficient drainage and easier cultivations: fertilisers may be used to swing the competitive balance in favour of stronger grasses and against weaker herbs: selective herbicides, at a single application, will eliminate almost all other vegetation save the grasses: regular cultivation and reseeding with new, high-yielding strains eliminates all but the most elusive wild grassland species. As in some other

spheres of agriculture, the objectives of efficient and profitable husbandry are barely compatible with the objectives of nature conservation.

The quality of the insect fauna, as evidenced by sightings of free-flying adults, was disappointing. One of the survey group collected and recorded caddis flies in sections 35, 37 and 38 during the 20-year period to 1958 and the results are embodied in a paper in the Transactions (ref. 8). There is no doubt that the present adult populations, assessed by what was seen during 1977-1979 of free-flyers or those disturbed or at rest, were noticeably smaller than in the 1950's. The diurnal swarms of small, brown, long-antennaed caddises (*Leptocerus* species) are still present, but the numbers of swarms and the individuals in each are much fewer now. It was commonplace two or three decades ago to see large numbers of other caddis species resting on reeds, tree trunks, bridge ledges, or in trees or bushes, but no instances of this kind were seen recently. Dragonflies were similarly scarce in nearly all sections.

Other naturalists (ref.9) have left records of the area which chronicle the loss of large Heronries from Costessey and from Taverham, the disappearance of the Wheatear from Taverham, and the departure of the Stone Curlew and the Nightjar from Costessey Common.

Proposals

Since this is the second survey of its kind in recent years, comparisons between the findings of the Yare Valley Survey (ref. 4) and the Wensum Valley Survey are inevitable. The impression of the survey group was that both valley systems included sites of great natural history interest and worthy of conservation, but that these sites were more frequent and, in several cases, more worthy in the Wensum Valley than in the Yare Valley. The group also felt that the nature of the threat to sites of ecological interest differed in the two valleys. In the Yare Valley there seemed more risk from increasing urbanisation, both as a direct effect of building developments and as an indirect effect of increasing populations with consequent recreational pressures. In the Wensum Valley, on the other hand, the recreational pattern of angling, sailing, water-skiing, walking, etc. is already well established, and the growth of communities in the area is limited, so that the most significant threat to the wildlife of the area emerged as the overzealous pursuit of agricultural objectives.

In view of the pressures upon such sites of natural history interest as remain in the valley, the survey group wishes to propose the following:
(a) That the following sites, which have been identified as of first class natural history significance, should be afforded substantial protection, and it is recommended that owners and planners should make no important changes in management policy for them:

Section 7 — Ringland Lakes
Section 18 — Costessey Pits
Section 20 — Costessey Common
Section 22 — Costessey Falcon
Section 37 — Hellesdon Road to Sweet Briar Road
Section 38 — Sweet Briar Road to Mile Cross Road.

Because of their proximity to the city, sections 37 and 38 seem particularly under threat, but in many ways have most to offer as ready-made nature reserves near the city, with a footpath already offering access along the length of section 38.

(b) That the following sites, which are of high natural history significance, should be identified as such to owners and planners so that the handling and disposal of the sites should be carried out in the knowledge of their ecological value:

Section 14 — Taverham Lakes West
Section 16 — Taverham Lakes East
Section 29 — Drayton Bloods Dale
Section 30 — Bridge Cottage Marsh
Section 32 — Wensum View Marsh

Sections 30 and 32 include a mosaic of different types of grazing marsh, well managed but not significantly 'improved' and therefore at risk. The area is accessible from the footpath which follows the old railway line.

(c) That the following sites, which provide good examples of their kind in the valley system, are worthy of protection:

Section 10 — Blackhill Wood
Section 11 — Blyth's Wood
Section 15 — Taverham Mill
Section 35 — Hellesdon Mill

Section 10 is a dry, acid woodland on an extension of the Ringland Hills. Section 11 is, conversely, a wet, neutral woodland but not far from the former. Sections 15 and 35 provide sites in the vicinity of rapids where grey wagtails nest, and which are also attractive to the black-bellied dipper.

Acknowledgements

The authors wish to thank the owners of land who permitted the survey team access to the areas reviewed.

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QUERCUS ILEX L. IN NORFOLK

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The holm oak, *Quercus ilex* L., is attacked by the leaf-mining lepidopteron *Phyllonorycter messaniella* Zeller. This insect feeds in the leaves of native oaks and sweet chestnut in summer and those of holm oak in winter. A survey of *Q. ilex* in Norfolk was made whilst investigating the population dynamics of the leaf-miner. Most recording of *Q. ilex* was undertaken during the winter when it is relatively easy to see and identify at a distance with binoculars.

It was found at 701 sites in Norfolk (FIG. 1, APPENDIX 1); 60 of these sites were reported to us in response to an appeal for information on the species in the society newsletter. Commonly the trees occur as singletons or as groups of specimen trees, sometimes in avenues, occasionally as shelter-belts, in hedges or in woods of up to 500 trees. There is an extensive distribution throughout the county (FIG. 1, TABLE 1). A preponderance of sites and highest densities occur within 5 Km of the coast, particularly at Holkham, which is pre-eminent in Norfolk for this species. Substantial numbers also occur at Hunstanton, Cromer, Overstrand, North Repps, Happisburgh, Melton Constable and Ludham. Over half the locations (362) are in private gardens mainly of large houses, a good number (177) in parkland of country estates, 76 in various ecclesiastic places (42 in churchyards and 34 in rectories), 32 in public places such as cemeteries, schools, hospitals and playing fields, a small number (31) are woodland sites, some of which have developed from parkland, and the remaining 23 sites are mainly in farmland, with 3 on heathland and 2 on dunes.

Q. ilex had been introduced into England by the early sixteenth century; Clusius (in Gerarde, 1636) recorded a mature tree at Whitehall in 1581. It is probable that the first planting in Norfolk was at Holkham near the Obelisk in 1729 (estate records). Other planting of this period can be deduced from the tree dimensions to have occurred at Gillingham Hall (Grigor, 1847), Ken Wood (Elwes & Henry, 1906-13) and, slightly later, at North Elmham Hall (Grigor, 1847). Grigor (1847) recorded smaller trees in Norwich, at Bracondale and Thorpe, Wymondham, Aylsham, Yarmouth, Thetford, Hunstanton Hall and Whittington and their planting would have been late eighteenth/early nineteenth century. *Q. ilex* regenerates freely from acorns (and by regrowth from damaged tree bases). In Norfolk regeneration occurs at a minimum of 33 sites (Appendix 1). Despite this ability, it is clear that there has been little natural spread of the tree throughout the county (James *et al.*, 1981). Even at Holkham dunes, where the apparent naturalization is familiar to many naturalists, acorns have been planted from time to time by estate workers (R. Taylor, pers. comm., 1979). Virtually all *Q. ilex* in Norfolk

are the result of deliberate planting. In several places, e.g. Overstrand and Taverham, regeneration has led to naturalization, but at most regeneration sites this is unlikely because of removal of seedlings by man.

Acknowledgements

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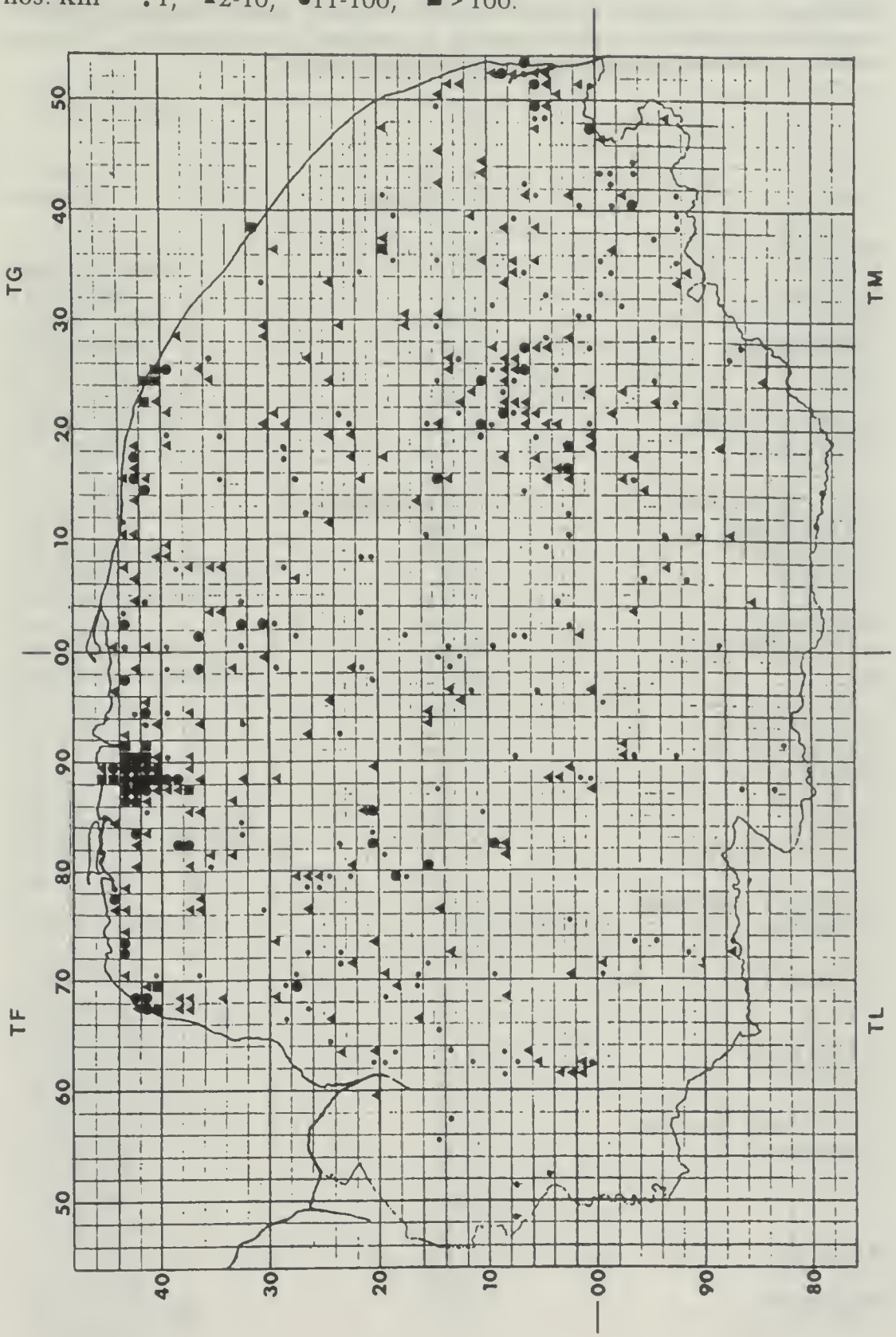
Table 1 Numbers and Density of *Q. ilex* in Norfolk

Region	Area Km^2	Number of sites	Sites with single specimens	Number of *Q. ilex*	Density Km^{-2}	Number of *Q. ilex* >40′
Coastal zone	650	224 (*13)	62	2112	3.25	780
Holkham	35	67 (*9)	3	2326	66.46	1750
Norwich	35	24 (*2)	17	73	2.09	8
Broadland	490	78 (*1)	45	347	0.71	125
NW Norfolk	1000	95 (*1)	44	340	0.34	76
NE Norfolk	850	70 (*4)	36	321	0.38	84
SE Norfolk	930	79 (*3)	48	183	0.20	90
SW Norfolk	420	38	26	79	0.19	15
Breckland	420	15	9	30	0.07	4
Fenland	480	11	9	13	0.03	6
Total	5310	701 (*33)	299	5824	1.10	2938

* regeneration sites

FIGURE 1 Norfolk distribution of *Q. ilex*:
nos. Km^{-2} . 1, ▲2-10, ●11-100, ■ > 100.



Appendix 1. Site Records of *Q. ilex* in Norfolk

Locations stated as parishes except at Holkham, Norwich, Great Yarmouth and King's Lynn. Sites classified as G private garden, Pk parkland, Ec ecclesiastical, Pb public garden *s.l.*, Wd woodland, Et other. Regeneration denoted*

Location	*Site type*	*Nos.*	*Grid reference*
ALBURGH	G	1	62/267.871
,,	G	1	62/272.866
ALBY HILL	G	1	63/191.341
ANMER	Ec	3	53/737.295
ARMINGHALL	Pk	1	63/258.039
ASHILL	G	8	53/882.036
,,	Ec	3	53/884.040
ASHWELLTHORPE	Ec	1	62/147.977
ASHWICKEN	Ec	4	53/698.189
,,	Pk	2	53/701.191
*ATTLEBOROUGH	Pb (hospital)	10	62/031.961
ATTLEBRIDGE	Wd	*c*5	63/139.160
AYLMERTON	G	3	63/186.390
AYLSHAM	G	1	63/202.280
,,	Pk	3	63/203.284
BABINGLEY	G	1	53/671.263
BACONSTHORPE	Ec	1	63/128.368
BALE	Ec	22	63/011.368
,,	G	1	63/010.368
BANNINGHAM	Ec	2	63/216.295
BARMER	G	2	53/813.337
BARWICK	Pk	1	53/804.358
,,	G	7	53/810.354
BAWSEY	G	1	53/680.198
BEESTON REGIS	Ec	3	63/171.427
,,	G	*c*8	63/174.427
BEESTON ST ANDREW	Pk	3	63/255.138
BEIGHTON	G	1	63/383.085
,,	G	2	63/385.081
BERGH APTON	G	1	63/305.008
,,	G	1	63/306.016
,,	G	1	62/320.996
BESTHORPE	G	1	62/068.955
BINHAM	G	1	53/983.394
,,	G	1	53/983.422
BLACKBOROUGH END	G	1	53/659.149
BLAKENEY	G	1	63/022.438
,,	G	*c*6	63/027.438
,,	G	*c*6	63/028.437
,,	Ec	1	63/032.435
BLICKLING	Pk	1	63/178.288
,,	Pk	1	63/183.282
BOUGHTON	Ec	2	53/700.021
BRACON ASH	G	3	63/180.004

BRADWELL	G	1	63/502.031
,,	G	7	63/502.038
,,	G	1	63/507.039
,,	Pk	2	63/512.015
,,	G	6	63/512.053
BRAMPTON	G	1	63/215.232
BRANCASTER	Ec	1	53/772.440
,,	G	12	53/774.440
,,	G	5	53/775.441
,,	G	*c*10	53/778.441
,,	Pk	2	53/780.433
,,	G	1	53/781.441
BRININGHAM	G	*c*5	63/036.344
BRINTON	G	4	63/038.358
BROOKVILLE	G	1	52/735.964
BRUNDALL	Et (farmland)	1	63/317.094
,,	G	*c*4	63/330.082
BUCKENHAM	Et (farmland)	3	63/352.058
BURGH CASTLE	Ec	4	63/476.050
,,	G	1	63/480.046
,,	G	1	63/483.053
* ,,	G	10	63/492.053
,,	G	4	63/494.053
,,	Pk	5	63/496.049
BURGH ST MARGARET	Pk	2	63/452.140
BURGH ST PETER	G	1	62/486.937
,,	G	1	62/486.937
BURLINGHAM	Pk	2	63/359.108
BURNHAM MARKET	G	2	53/803.420
,,	Wd	*c*10	53/830.413
,,	Wd	1	53/830.427
,,	G	19	53/836.422
,,	Ec	3	53/838.423
BURNHAM NORTON	G	3	53/828.432
BURNHAM THORPE	G	1	53/856.413
BURNHAM WESTGATE	Ec	*c*10	53/830.422
,,	G	4	53/826.423
CAISTER-ON-SEA	Pb (cemetery)	*c*10	63/518.130
,,	Ec	*c*10	63/519.123
CANTLEY	G	2	63/383.052
CARBROOKE	G	2	53/962.007
CARLETON RODE	G	1	62/106.935
CASTLE ACRE	G	*c*25	53/808.159
CASTLE RISING	G	2	53/665.248
CHEDGRAVE	G	1	62/357.998
CLENCHWARTON	G	2	53/597.200
CLIPPESBY	G	2	63/425.144
COLKIRK	G	2	53/921.265
COLNEY	Pk	2	63/171.083
CONGHAM	G	2	53/710.229
,,	G	1	53/719.239
,,	G	1	53/720.238
CRANWORTH	Pk	1	53/968.057
CRINGLEFORD	G	1	63/194.056

CROMER	G	6	63/220.415
,,	G	1	63/222.418
,,	G	3	63/222.419
,,	G	*c*6	63/223.417
,,	Pb (disused railway)	5	63/224.409
* ,,	G	*c*6	63/224.413
,,	G	*c*30	63/224.418
,,	G	20	63/224.419
,,	G	*c*15	63/225.419
* ,,	Wd	*c*70	63/227.418
,,	G	2	63/228.411
CROSTWIGHT	Ec	1	63/333.300
CROXTON	Ec	1	52/874.865
DERSINGHAM	Wd	*c*10	53/682.293
DISS	G	1	62/118.797
DITCHINGHAM	Ec	6	62/335.924
,,	Ec	1	62/336.926
,,	Ec	3	62/342.910
DOCKING	Ec	2	53/763.371
,,	Pk	4	53/767.369
,,	Pk	4	53/768.369
,,	G	5	53/772.368
,,	G	1	53/775.368
DOWNHAM MARKET	G	1	53/612.024
,,	Pb (school)	1	53/612.028
,,	Pb (school)	4	53/613.030
,,	Ec	2	53/613.032
,,	G	1	53/615.036
DUNTON	G	2	53/880.305
EAST CARLTON	Ec	*c*7	63/180.021
,,	Pk	15	63/186.028
,,	Wd	2	63/189.022
EAST DEREHAM	G	1	53/981.134
,,	Pb (cemetery)	1	53/991.140
,,	G	1	53/992.121
,,	G	1	63/006.132
EAST RUSTON	Pk	2	63/364.296
EAST SOMERTON	Pk	2	63/477.198
EAST WINCH	G	1	53/694.163
,,	Pk	1	53/704.163
ELLINGHAM	Pk	1	62/357.929
EMNETH	G	1	53/487.074
EMNETH HUNGATE	G	1	53/514.074
ERPINGHAM	G	2	63/201.362
FAKENHAM	G	1	53/936.322
FELBRIGG	Pk	1	63/192.395
,,	G	6	63/215.392
FELTHORPE	G	3	63/175.192
FELTWELL	G	1	52/712.908
,,	Pk	1	52/715.906
,,	Ec	1	52/726.912
FIELD DALLING	G	1	63/007.390
FLITCHAM	G	1	53/707.276
FOXLEY	G	1	63/038.217
FRAMINGHAM EARL	G	3	63/280.028

FRAMINGHAM PIGOT	G	2	63/270.043
FREETHORPE	G	1	63/414.050
FRITTON	G	1	62/227.924
,,	Wd	6	62/467.998
,,	Pk	3	62/469.998
,,	Pk	9	63/476.002
,,	Pk	1	63/479.004
,,	Wd	3	63/479.007
FULMODESTON	G	1	53/986.294
,,	G	1	53/990.302
,,	Ec	4	53/993.309
FUNDENHALL	G	1	62/150.965
,,	Et (farmland)	*c*4	62/157.970
GARVESTON	G	1	63/014.076
GATELEY	Pk	2	53/959.240
GAYTON	G	2	53/733.207
GELDESTON	G	1	62/385.923
,,	Pk	1	62/398.923
GILLINGHAM	Pk	1	62/413.923
GLANDFORD	Et (old field)	1	63/043.416
GOODERSTONE	G	1	53/759.020
GT BIRCHAM	G	1	53/760.302
GT DUNHAM	G	1	53/872.143
GT MASSINGHAM	G	1	53/798.225
,,	G	1	53/802.228
,,	G	1	53/804.225
,,	G	1	53/826.237
GT MELTON	G	1	63/142.062
GT WALSINGHAM	G	3	53/941.377
GT YARMOUTH	G	6	63/517.053
,,	Pb (cemetery)	6	63/518.043
,,	G	1	63/522.060
,,	G	5	63/523.096
,,	Pb (park)	2	63/524.045
,,	G	8	63/525.051
,,	G	1	63/525.052
,,	Pb (park)	8	63/527.074
,,	Pb (cemetery)	8	63/527.082
,,	Pb (cemetery)	15	63/527.085
,,	G	1	63/529.084
,,	G	3	63/530.066
,,	Pb (pleasure-garden)	17	63/531.064
,,	Pb (pleasure garden)	2	63/531.067
GRESSENHALL	G	2	53/969.139
GRISTON	Ec	1	52/943.994
GUESTWICK	G	3	53/062.272
GUNTHORPE	Pk	2	53/007.347
GUNTON	Pk	2	53/225.341
,,	Pk	3	53/244.342
HADDISCOE	Pk	1	62/434.967
,,	G	1	62/442.962
HALVERGATE	G	1	63/418.067
,,	G	4	63/418.069
,,	G	1	63/420.068

HAPPISBURGH	G	*c*80	63/381.310
,,	Ec	6	63/381.311
HAPTON	G	1	62/175.966
,,	Ec	1	62/176.967
HARDINGHAM	Pk	1	63/046.037
HARPLEY	G	2	53/760.263
,,	Ec	1	53/787.261
,,	G	1	53/788.257
,,	G	4	53/790.258
,,	Wd	1	53/791.262
,,	G	1	53/792.264
HAVERINGLAND	Pk	4	63/153.213
HEACHAM	Wd	2	53/672.375
,,	Pk	3	53/679.383
,,	G	1	53/681.378
,,	Ec	6	53/681.380
,,	Pk	1	53/681.381
,,	G	1	53/682.376
,,	G	2	53/682.377
HEMPNALL	Wd	2	62/224.948
,,	G	1	62/240.945
HETHERSETT	G	1	63/152.042
,,	G	1	63/152.043
,,	G	1	63/154.046
,,	Wd	2	63/170.053
HEVINGHAM	Et (farmland)	2	63/199.224
,,	G	1	63/201.224
HILLINGTON	Pk	1	53/726.261
HINDOLVESTON	G	1	63/029.294
HINDRINGHAM	Ec	*c*14	53/981.369
HINGHAM	G	2	63/018.013
,,	Et (farmland)	7	63/019.013
,,	G	1	63/023.023
HOCKWOLD	Ec	2	52/725.879
,,	G	1	52/731.879
HOLKHAM	Pk	5	53/867.429
,,	Pk	22	53/869.420
,,	Pk	10	53/869.429
,,	Pk	5	53/869.432
,,	Pk	*c*18	53/870.422
,,	Pk	8	53/872.408
,,	Pk	10	53/872.427
,,	Pk	15	53/873.413
,,	Pk	*c*60	53/873.436
,,	Pk	*c*20	53/876.430
,,	Wd	6	53/877.372
* ,,	Wd	8	53/877.373
* ,,	Wd	*c*150	53/877.376
,,	Wd	2	53/877.383
,,	Pk	5	53/877.399
,,	Pk	5	53/877.436
,,	Wd	5	53/878.373
* ,,	Wd	3	53/878.383
,,	Pk	1	53/878.388
,,	Pk	5	53/878.416

HOLKHAM	Pk	*c*120	53/878.436
,,	Pk	5	53/880.416
,,	Pk	5	53/880.427
,,	Pk	1	53/881.400
,,	Pk	3	53/881.428
,,	Pk	18	53/882.390
,,	Pk	7	53/882.392
,,	Pk	5	53/882.394
,,	Pk	15	53/882.397
,,	Pk	5	53/882.420
,,	Pk	12	53/883.387
,,	Pk	16	53/883.399
* ,,	Pk	*c*500	53/883.412
,,	Pk	*c*150	53/883.442
,,	G	3	53/884.384
,,	G	3	53/884.386
,,	Pk	5	53/885.407
,,	Pk	*c*80	53/885.415
,,	Pk	12	53/885.425
,,	Pk	*c*20	53/885.428
,,	Pk	2	53/886.436
* ,,	Et (dunes)	*c*100	53/886.450
,,	Pk	*c* 35	53/889.403
,,	Pk	*c*120	53/890.430
,,	Pk	*c*12	53/890.439
,,	G	5	53/891.440
,,	Pk	4	53/891.448
,,	Pk	*c* 80	53/892.437
,,	Pk	4	53/892.440
,,	Pk	9	53/892.441
* ,,	Et (dunes)	10	53/892.450
,,	Wd	7	53/893.376
,,	Pk	*c*30	53/893.405
,,	G	*c*20	53/893.437
,,	G	5	53/894.440
,,	G	5	53/895.440
,,	Pk	*c*40	53/898.420
,,	G	10	53/901.379
,,	G	5	53/901.406
,,	Pk	*c*160	53/901.421
,,	Pk	20	53/901.431
,,	Pk	10	53/901.433
,,	Pk	*c*60	53/902.412
,,	Pk	14	53/902.434
,,	Pk	*c*60	53/905.435
,,	G	1	53/909.394
* ,,	Pk	*c*150	53/911.414
HOLME HALE	Pk	1	53/901.079
HOLME NEXT THE SEA	G	2	53/706.435
,,	G	3	53/708.430
,,	Ec	2	53/708.435
HOLT	G	1	63/073.387
,,	Pk	2	63/079.379
,,	G	1	63/084.391

HOLT	G	2	63/085.392
,,	G	*c*10	63/095.395
HOPTON	G	1	63/517.003
HORSFORD	Pk	1	63/204.141
,,	Pk	1	63/207.142
,,	Et (farmland)	1	63/209.152
HOUGHTON	Pk	*c*10	53/793.279
HOWE	Ec	1	63/275.001
HUNSTANTON	Pb (street)	1	53/671.402
,,	G	1	53/671.407
,,	Pb (street)	*c*10	53/673.411
,,	Pb (street)	*c*15	53/673.413
,,	G	1	53/675.405
,,	G	*c*10	53/675.413
,,	G	1	53/675.417
,,	G	2	53/676.405
,,	G	25	53/676.406
,,	Pb (sports-ground)	4	53/678.410
,,	Pb (street)	5	53/678.416
,,	Et (farmland)	1	53/678.421
,,	Wd	1	53/678.424
,,	G	10	53/682.423
,,	Wd	10	53/684.420
,,	Pb (street)	2	53/685.421
,,	Wd	*c*50	53/686.416
,,	Wd	10	53/686.420
,,	Pb (golf-course)	*c*3	53/686.428
,,	Wd	*c*500	53/698.416
,,	Pk	6	53/694.422
HUNWORTH	Ec	*c*10	63/071.354
KELLING	Pk	2	63/089.417
,,	G	3	63/097.428
KENNINGHALL	G	2	62/044.856
KESWICK	Pk	5	63/206.039
,,	Pk	1	63/206.041
,,	Pk	4	63/207.044
KETTERINGHAM	Pk	3	63/159.025
* ,,	Pk	10	63/162.026
* ,,	Pk	10	63/162.033
,,	Pk	1	63/164.026
KIMBERLEY	Pk	1	63/090.048
KING'S LYNN	Pb (municipal)	1	53/620.197
,,	G	1	53/623.203
,,	G	1	53/633.183
,,	Pk	2	53/638.204
KIRBY BEDON	G	4	63/278.053
,,	G	3	63/279.054
,,	Ry (farmland)	*c*35	63/279.063
,,	G	1	63/284.057
KIRBY CANE	Pk	1	62/373.941
LANGHAM	G	3	63/001.416
,,	G	1	63/008.413
LEZIATE	G	2	53/696.182

LT CRESSINGHAM	G	1	53/873.002
,,	G	1	53/873.003
LT MASSINGHAM	G	1	53/795.240
LT WALSINGHAM	Ec	2	53/938.369
LODDON	Pb (municipal)	1	62/363.986
,,	Ec	1	62/363.988
,,	G	1	62/364.986
,,	G	1	62/367.988
LONGHAM	Ec	1	53/932.159
,,	G	2	53/939.154
,,	G	3	53/940.155
LUDHAM	Pk	10	63/368.197
,,	Pk	47	63/372.190
,,	Pk	60	63/375.191
,,	Pk	3	63/375.197
,,	G	1	63/392.187
MARHAM	G	1	53/707.095
MARSHAM	Pk	2	63/199.246
MATLASK	G	1	63/154.349
*MELTON CONSTABLE	Pk	*c*70	63/025.322
,,	Pk	1	63/040.324
MERTON	Pk	1	52/906.968
,,	Pk	7	52/907.972
,,	Pk	2	52/908.972
,,	Pk	2	52/910.975
METHWOLD	G	1	52/735.949
MIDDLETON	Pk	3	53/660.161
MORSTON	G	3	63/006.440
,,	G	1	63/009.439
MOULTON ST MARY	G	1	63/399.073
MULBARTON	G	2	63/195.006
,,	G	1	63/202.008
NARFORD	Pk	2	53/766.140
NEATISHEAD	G	1	63/341.213
,,	G	1	63/354.188
NEW BUCKENHAM	G	1	62/107.906
NEW RACKHEATH	G	1	63/296.146
NEWTON FLOTMAN	G	4	62/210.988
NORTH CREAKE	Et (farmland)	*c*18	53/827.830
* ,,	G	*c*45	53/828.378
,,	G	2	53/855.374
NORTH ELMHAM	Et (farmland)	1	53/977.204
,,	Pk	4	53/985.218
,,	Pk	1	53/987.216
NORTHREPPS	Pk	1	63/229.398
,,	Pk	1	63/231.399
,,	G	3	63/239.401
,,	Ec	4	63/244.391
* ,,	Pk	*c*100	63/255.383
NORTH WALSHAM	G	3	63/283.302
,,	Ec	1	63/283.303
,,	G	2	63/288.309
NORTH WOOTTON	G	4	53/639.235
,,	Ec	1	53/647.245

NORTON SUBCOURSE	G	1	62/406.987
NORWICH	G	1	63/199.104
,,	G	1	63/204.064
,,	G	1	63/205.064
,,	Pb (industrial)	12	63/205.104
,,	G	1	63/208.094
,,	G	1	63/210.126
,,	G	2	63/213.069
* ,,	Pb (cemetery)	12	63/213.087
,,	G	2	63/218.054
,,	G	1	63/218.073
,,	G	1	63/219.088
,,	G	1	63/220.068
,,	G	1	63/223.067
,,	G	1	63/223.075
,,	G	1	63/223.086
,,	G	1	63/223.087
,,	G	1	63/241.072
,,	G	1	63/241.084
,,	G	1	63/245.081
,,	Et (heath)	*c*20	63/249.104
,,	G	4	63/252.084
* ,,	G	4	63/223.073
OLD BUCKENHAM	G	1	62/064.916
,,	Et (farmland)	2	62/078.930
OLD CATTON	Pk	*c*10	63/228.120
,,	Pk	4	63/233.116
,,	G	1	63/235.117
ORMESBY ST MARGARET	G	1	63/496.147
,,	G	3	63/500.148
,,	G	3	63/505.148
OULTON STREET	G	1	63/154.276
OUTWELL	G	1	53/527.047
OVERSTRAND	Ec	2	63/240.407
* ,,	Pk	*c*50	63/240.408
,,	Ec	12	63/241.408
,,	Pk	1	63/242.408
,,	G	2	63/244.406
,,	G	2	63/244.407
,,	G	5	63/244.408
,,	Pk	7	63/244.409
* ,,	Pk	*c*30	63/244.411
,,	G	2	63/245.407
,,	G	1	63/245.409
,,	G	12	63/245.410
* ,,	Pk	*c*24	63/245.411
,,	G	1	63/246.406
,,	Pb (sports-ground)	24	63/246.407
,,	G	15	63/246.408
,,	G	*c*50	63/246.409
,,	G	8	63/246.411
,,	G	5	63/248.406
,,	G	1	63/248.407
,,	G	6	63/248.408

OVERSTRAND	G	1	63/249.406
,,	G	8	63/249.407
,,	G	1	63/250.405
,,	G	1	63/250.408
,,	G	5	63/253.404
OVERY STAITHE	G	5	53/842.442
,,	G	7	53/845.443
PENTNEY	G	7	53/722.138
POTTER HEIGHAM	G	1	63/416.197
QUIDENHAM	G	1	62/007.884
RANWORTH	Ec	1	63/356.148
RAVENINGHAM	Ec	3	62/398.964
,,	Pk	*c*15	62/400.963
REEDHAM	G	1	63/407.015
,,	G	*c*6	63/417.023
REYMERSTON	G	1	63/013.067
RINGSTEAD	G	1	53/709.403
ROCKLAND ST MARY	G	1	63/325.047
ROUGHAM	G	1	53/814.197
,,	Pk	13	53/827.206
,,	Ec	1	53/831.206
RUNCTON HOLME	G	1	53/616.088
RYSTON	Pk	3	53/617.019
,,	Ec	3	53/621.017
,,	Pk	1	53/627.005
,,	Pk	1	53/628.010
SAHAM TONEY	Pk	1	53/888.013
,,	Ec	1	53/897.021
,,	Ec	4	53/898.020
,,	Ec	1	53/899.022
SALHOUSE	Pk	2	63/302.142
SALL	Ec	1	63/110.249
,,	Pk	1	63/115.245
SALTHOUSE	Et (heath)	3	63/060.424
,,	Ec	3	63/076.437
,,	G	1	63/078.437
SANDRINGHAM	Pk	*c*18	53/694.274
,,	Pk	*c* 18	53/695.275
,,	Pk	1	53/698.288
SAXLINGHAM NETHERGATE	Wd	6	62/234.972
SCARNING	Ec	5	53/955.122
,,	G	1	53/969.119
SCOLE	Et (farmland)	1	62/148.786
SCULTHORPE	Pk	4	53/885.320
,,	Pk	5	53/886.324
SEDGEFORD	G	1	53/707.364
SEETHING	G	2	62/319.978
SETCHEY	G	1	53/637.132
SHADWELL	Pk	1	52/917.822
SHERINGHAM	Pk	6	63/134.424
,,	Pk	6	63/140.419
,,	G	10	63/151.428
,,	G	6	63/152.430
,,	G	1	63/154.430

SHERINGHAM	G	6	63/156.410
,,	G	2	63/159.428
,,	G	3	63/160.428
SHOULDHAM	Ec	2	53/682.089
SIDESTRAND	Pk	*c*25	63/258.397
,,	Pk	*c*25	63/259.398
,,	Pk	4	63/261.398
SISLAND	Ec	1	62/345.986
SLOLEY	Pk	5	63/295.234
SMALLBURGH	G	2	63/332.240
SNETTISHAM	G	5	53/685.344
SOUTH CREAKE	G	2	53/855.361
,,	Ec	1	53/855.364
,,	G	3	53/867.338
,,	G	2	53/888.362
SOUTHREPPS	G	1	63/254.367
,,	G	1	63/255.366
,,	G	1	63/264.356
SOUTH RUNCTON	G	1	53/635.086
SPARHAM	Pk	1	63/082.203
SPIXWORTH	Et (farmland)	1	63/242.149
SPORLE	G	1	53/850.107
SPROWSTON	Pk	6	63/265.134
,,	G	1	63/267.122
STANHOE	G	2	53/803.371
STARSTON	Ec	3	62/245.844
,,	G	2	62/244.846
,,	G	1	62/244.847
,,	Et (farmland)	1	62/245.848
*STIFFKEY	Wd	10	53/969.440
* ,,	G	*c*10	53/971.432
,,	G	4	53/975.432
STOKE FERRY	G	1	52/705.998
STOKE HOLY CROSS	G	4	63/235.008
STOKESBY	Ec	5	63/435.106
,,	Pk	5	63/447.106
STOW BARDOLPH	G	1	53/628.057
,,	Pk	1	53/629.058
,,	Pk	2	53/632.060
STRUMPSHAW	G	1	63/348.067
,,	G	1	63/348.074
,,	G	1	63/348.076
,,	G	1	63/355.079
,,	Ec	1	63/359.073
SWAFFHAM	G	1	53/816.083
,,	G	1	53/818.087
,,	G	1	53/819.088
,,	G	1	53/820.093
,,	G	1	53/822.092
,,	G	6	53/823.083
,,	G	3	53/824.087
,,	Wd	12	53/828.094
SWANTON ABBOT	Ec	3	63/266.262
SWANTON MORLEY	Ec	1	63/019.175

SWANTON NOVERS	G	1	63/002.320
* ,,	Wd	*c*20	63/020.305
,,	Pk	1	63/023.320
,,	Pk	*c*18	63/024.328
SYDERSTONE	Ec	1	53/833.328
,,	Pk	1	53/849.328
TACOLNESTON	G	1	62/140.955
,,	G	1	62/144.951
TAVERHAM	Pk	2	63/151.139
* ,,	Pk	*c*45	63/153.143
THETFORD	Pb (municipal)	2	52/870.832
THORNHAM	G	*c*45	53/723.433
,,	Et (farmland)	13	53/732.436
,,	Ec	7	53/733.435
,,	G	4	53/734.433
,,	Ec	7	53/735.435
,,	Pb (school)	*c*3	53/738.435
,,	G	4	53/740.434
THORPE MARKET	Ec	1	63/244.356
,,	Ec	1	63/245.354
THORPE ST ANDREW	Pb (municipal)	1	63/258.096
,,	Ec	1	63/261.084
,,	G	2	63/264.084
,,	Pk	2	63/273.090
THREXTON	Et (farmland)	1	53/885.004
THURLTON	G	2	62/415.978
,,	G	1	62/420.987
,,	G	1	62/436.984
,,	G	1	62/436.991
THURSFORD	Pk	6	53/984.334
,,	Pk	2	53/985.337
TILNEY ST LAWRENCE	G	1	53/552.148
TITCHWELL	G	6	53/760.437
,,	Ec	6	53/761.449
TITTLESHALL	G	10	53/899.208
TIVETSHALL ST MARGARET	G	1	62/184.884
TRIMINGHAM	G	2	63/286.386
TROWSE NEWTON	Pk	1	63/251.073
,,	Pb (road-island)	1	63/255.061
,,	G	1	63/256.063
,,	Pk	1	63/256.069
,,	Pk	1	63/257.066
* ,,	Pk	*c*40	63/257.067
,,	Pk	1	63/259.070
,,	Pk	1	63/265.077
,,	Pk	1	63/268.077
UPPER SHERINGHAM	Pb (hospital)	*c*20	63/141.418
UPTON	G	2	63/393.115
WALLINGTON	G	1	53/627.076
WARHAM	G	1	53/939.416
,,	Et (farmland)	3	53/942.416
,,	Ec	26	53/942.418
,,	G	3	53/945.417
,,	Ec	4	53/948.416

WARHAM	Wd	3	53/949.416
,,	G	1	53/949.420
,,	G	6	53/953.413
WATLINGTON	Pk	1	53/624.113
WEASENHAM ALL SAINTS	Pk	*c*10	53/850.208
,,	Pb (school)	2	53/852.214
,,	Wd	10	53/857.200
WELLS NEXT THE SEA	Pb (hospital)	6	53/907.435
,,	G	2	53/915.431
,,	Et (foot-path)	13	53/915.435
,,	G	4	53/915.435
,,	G	2	53/915.436
,,	G	6	53/916.430
,,	G	6	53/916.431
,,	G	1	53/916.434
,,	G	4	53/916.436
,,	G	3	53/917.431
,,	G	1	53/917.434
,,	G	1	53/917.435
,,	G	2	53/917.436
,,	Ec	1	53/918.431
,,	G	15	53/918.433
,,	G	3	53/918.434
* ,,	Pb (school)	8	53/918.435
,,	G	32	53/918.436
,,	G	2	53/920.437
WEST ACRE	Pk	8	53/790.181
,,	Pk	5	53/793.182
,,	Pk	1	53/796.175
WEST BILNEY	Ec	1	53/716.153
WESTON LONGVILLE	G	1	63/105.156
WEST RUNTON	G	1	63/182.426
,,	G	2	63/188.428
WEST SOMERTON	Ec	4	63/475.196
WEYBOURNE	G	2	63/106.428
,,	G	3	63/109.430
,,	Ec	1	63/112.433
WHINBURGH	G	1	63/009.091
WHISSONSETT	G	1	53/923.233
WHITTINGTON	G	6	52/715.993
,,	G	1	52/716.992
WHITWELL	G	1	63/087.214
WIGGENHALL ST MARY THE VIRGIN	G	1	53/572.133
WIGHTON	G	4	53/936.405
,,	G	1	53/953.413
WINFARTHING	G	2	62/108.878
WIVETON	G	3	63/042.427
WOLFERTON	G	1	53/660.282
WOLTERTON	Pk	4	63/170.323
WOOD NORTON	G	1	63/007.284
,,	Pk	1	63/013.277
WOODTON	Wd	4	62/284.947
WRETHAM	Pk	1	52/903.928
WROXHAM	G	*c*10	63/297.173

WROXHAM	G	1	63/300.171
,,	G	3	63/304.173
,,	G	1	63/304.175
WYMONDHAM	G	1	63/107.025
,,	G	1	63/122.027

ECOLOGICAL APPRAISAL OF THE HELLESDON-FREELAND CORNER SECTION OF THE DISUSED M. & G.N. RAILWAY LINE

by Alan Scowen

Planning Department, Norfolk County Council

Pre-Amble

This railway line was constructed in 1882 by the Lynn and Fakenham Railway and taken over in the same year by the Eastern and Midlands Railway. In 1893 the Midland and Great Northern Railways acquired the line, which started at Norwich City Station and went as far as Melton Constable. The passenger service continued until 1959, although freight services continued for another decade before the tracks were lifted.

This study concerns a section of the former railway track between Hellesdon and Freeland Corner (approximately 8 kilometres long). The Hellesdon-Drayton section was acquired by Norfolk County Council, and opened as a concessionary path for recreation in 1977 after management work carried out by Norfolk County Council, South Norfolk District Council, Broadland District Council and Costessey Parish Council. The Drayton-Freeland Corner section was acquired by Broadland District Council and opened as concessionary path in 1980, after management work by the same council. Broadland District Council are interested in further acquisition of land owned by British Rail, in order to extend the route as far as Attlebridge.

The railway track passes through farmland and it is necessary to consider the special interests of neighbouring farmers including crop damage by vermin, the transmission of diseases to livestock and the spread of noxious weeds. In an interpretive leaflet it is requested that dogs should be kept under proper control and that no litter is left by visitors. There are few traces of rabbits (although a hare was seen on the track) but all of the factors applying to neighbouring farmland are kept under review.

Introduction

The ecological appraisal which was carried out in late summer 1979 was undertaken in order to evaluate the nature conservation value of the two component lengths of the track, and compare the effect of recreational use. Both sections of the track have been used on a casual basis by local residents since 1969. However, walkers and horseriders have been invited to use the stretch nearest Norwich (Hellesdon-Drayton) by means of press publicity; signs on the route, the development of associated car parks and the publication of an interpretive leaflet. Clearly the volume of visitors is likely to have increased on the Hellesdon-Drayton stretch, and this will increase the 'pressures' on the natural environment. The following study is an ecological appraisal of the effects of heavy and light recreational use on two adjacent sections of the disused railway, which is potentially a valuable habitat for wildlife.

Description

(A) Freeland Corner-Drayton

In the past railway workers would have cleared the banks and verges to maintain a grassy sward. However, since the closure of the railway grass has given way to scrub, which is progressively getting thicker. The trees are chiefly a mixture of ash, oak and hawthorn. They provide very suitable cover for nesting birds. The young trees are growing well, and it is possible to imagine healthy strips of mature oaks and ashes developing. At present there is not a great deal of bramble, although some clearance might be desirable.

The scrub is presently not dense enough to prevent the penetration of light, and accordingly there is a wide range of plants to be seen, sufficient to make the area interesting, if not outstanding. The walking surface is approximately 1½ metres wide, although it does narrow to approximately 1 metre and widens to approximately 3 metres. The track has, for most of its length, a surface comprised of sand and gravel consolidated by vegetation; *Trifolium arvense*, Haresfoot Clover is particularly noticeable. In one section there is a clinker surface, and this is considerably more difficult to walk upon. As might be expected the sandy topsoil provides dry, slightly acid conditions, and plants on the track need to be able to tolerate both the disadvantages of these conditions and the pressures of trampling. There was no sign of horses hoof-marks or motor cycle tracks but farm vehicles cross the track at a number of places. Not surprisingly the flora on the track itself is not especially rich in species.

The banks and verges are most interesting floristically. They exhibit a wide range of the commoner specimens from the Norfolk flora. The invasion of willowherbs *Epilobium angustifolium*, Rosebay Willowherb and *Epilobium hirsutum*, Great Willowherb is especially noticeable although the incursion of other aliens is less marked eg *Oenothera erythrosepala*, large-flowered Evening Primrose — 2 specimens. A fair number of species of grass were present, including Smaller Cat's-Tail *Phleum bertolonii* which is less common than Timothy Grass *Phleum pratense*.

One of the characteristic plants, along this stretch is agrimony, *Agrimonia eupatoria*, which in places is to be found in quite large stands.

(B) Drayton-Hellesdon

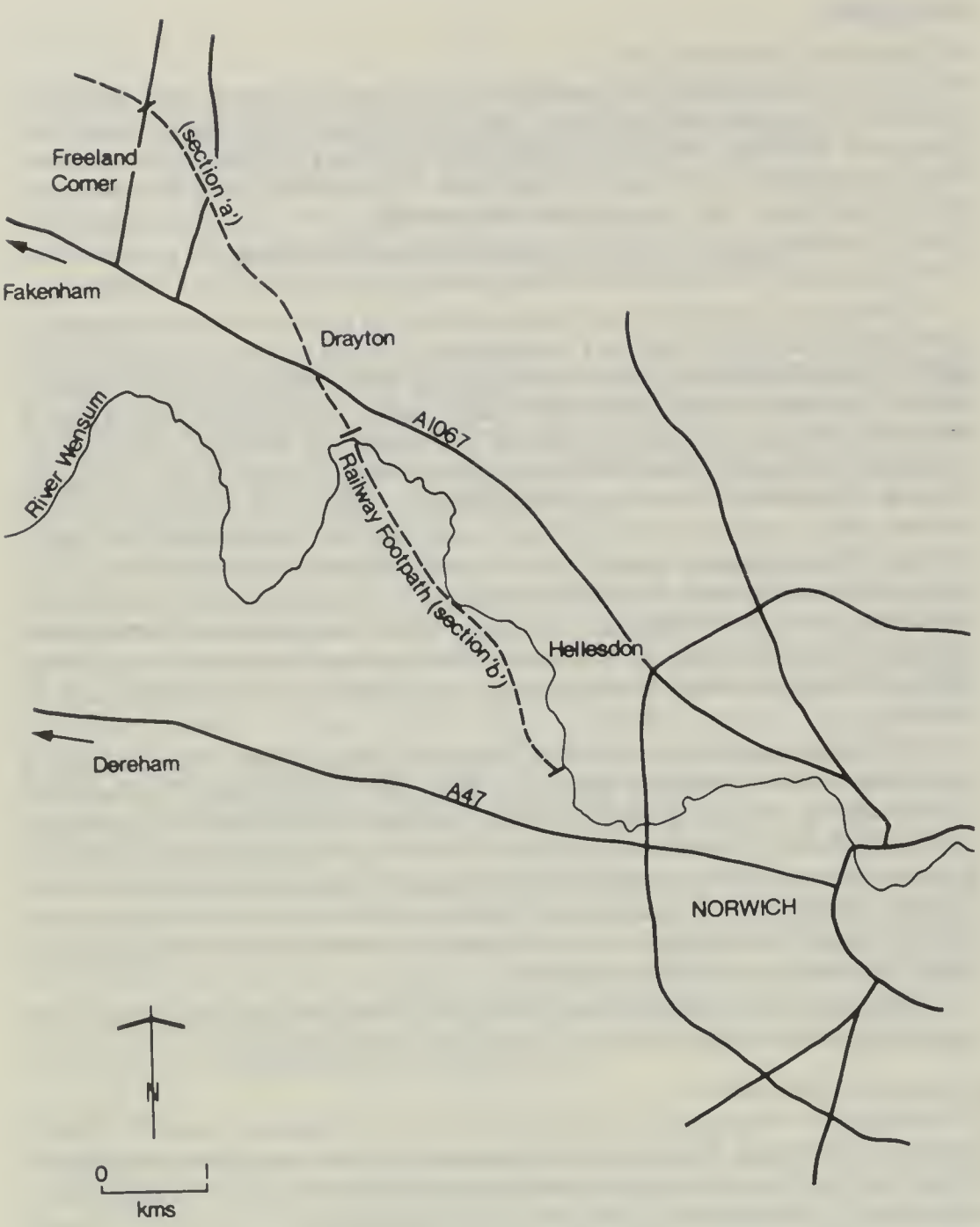
The difference between this section and the one described above is quite marked. The species: distance ratio (frequency) of flowering plants and grasses is much reduced on this section, and the central track is much wider (3-4m) and less well consolidated. This is due to 3 major factors:

(i) proximity of the track to Norwich and greater potential for use by walkers living in the neighbourhood;

(ii) designation of this section as a public footpath and bridleway; and

(iii) more intensive use (by horses, cyclists and motor cyclists) as compared to the occasional rambler exercising a dog on the first stretch.

On this section of track the vegetation is retreating towards the boundaries of the property, whereas on the first section it is encroaching onto the track.


Freeland
Corner
(section 'a')
Fakenham
Drayton
A1067
River Wensum
Railway Footpath (section 'b')
Hellesdon
Dereham
A47
NORWICH
N
0
kms

At present there is no cause for concern, but a regular inspection of the track for ecological monitoring purposes would be useful.

The diversity and abundance of species which commonly occurred over this section was reduced. Haresfoot Clover, which was frequent on the first section, is rarer on this section. Probably the most interesting species occur at the Drayton end, these include *Pastinaca sativa*, Wild Parsnip and *Reseda luteola*, Weld.

As might be expected the range of plants and animals in Hellesdon is affected by the more urban nature of the neighbouring land. Sparrows were quite common, and brown rats were seen near the station area.

The overall wildlife value of this section will improve as some of the trees which have been planted grow. However, at the present it is relatively low. The walking surface is at present quite adequate, although it may prove necessary to improve it at a later date. Furthermore, the access points need attention, if they are not well landscaped they will affect user's attitudes to the use of the entire track. There is very little need for ecological management works. Neither will any of the current uses (walking, cycling, horseriding, or even motor-cycling lead to serious damage to the natural environment.

If there are funds available some tree surgery and planting would be beneficial.

Conclusion

The Freeland Corner-Drayton section is considerably more interesting floristically than the Drayton-Hellesdon section, although many of the species are present on the latter section their numbers are much reduced. The survey which has been carried out suggests that the development of the disused railway as a recreational route going as far as Attlebridge will need to be approached more carefully if any ecological value is to be retained. The decrease in human population as you move from the suburban to the rural area may be an important variable, this has yet to be seen. However, it is clear that the section nearest the city is less interesting floristically than the Freeland Corner - Drayton path.

The approach to the further development and management of this track needs to take proper note of the ecological potential of the disused railway track and not only be concerned with the informal countryside recreation aspect. The track may also prove to be a valuable teaching resource.

Species List	*Freeland Corner-Drayton*	*Drayton-Hellesdon*
Equisetum palustre	x	x
Pteridium aquilinum	x	x
Ranunculus acris		x
Papaver rhoeas	x	x
Brassica nigra		x
Raphanus raphanistrum		x
Capsella bursa-pastoris	x	
Alliaria petiolata	x	
Sisymbrium officinale	x	x
Reseda luteola	x	x
Hypericum perforatium	x	x
Silene alba	x	x
Stellaria holostea	x	
Chenopodium album	x	
Malva sylvestris	x	x
Geranium robertianum	x	x
Acer pseudoplatanus	x	x
Ulex europaeus	x	x
Medicago lupulina	x	x
Trifolium pratense	x	x
Trifolium repens	x	x
Trifolium arvense	x	x
Trifolium campestre	x	x
Lotus corniculatus	x	x
Vicia cracca	x	x
Vicia hirsuta	x	x
Vicia sepium	x	x
Lathyrus latifolius		x
Cytisus scoparius	x	x
Filipendula vulgaris		x
Rubus fruticosus	x	x
Potentilla reptans	x	x
Potentilla erecta	x	
Fragaria vesca	x	
Agrimonia eupatoria	x	x
Rosa canina	x	x
Rosa domesticus	x	
Crataegus monogyna	x	x
Sorbus aria		x
Sorbus aucuparia		x
Sedum album	x	
Epilobium angustifolium	x	x
Epilobium hirsutum	x	x
Epilobium montanum	x	x
Epilobium parviflorum	x	x
Oenothera erythrosepala	x	x
Hedera helix	x	x
Anthriscus sylvestris	x	x
Conopodium majus	x	x
Pastinaca sativa	x	x
Heracleum sphondylium	x	x
Daucus carota	x	x
Rumex acetosa	x	x

Species List	*Freeland Corner-Drayton*	*Drayton-Hellesdon*
Rumex acetosella	x	x
Rumex obtusifolius	x	
Urtica dioica	x	x
Betula pendula	x	x
Alnus glutinosa	x	x
Fagus sylvatica		x
Quercus robur	x	x
Populus nigra	x	x
Salix caprea	x	x
Fraxinus excelsior	x	x
Vinca minor		x
Centaurium erythraea	x	
Convolvulus arvensis	x	x
Calystegia		x
Solanum sp. (potato)		x
Solanum dulcamara	x	
Verbascum thapsus	x	x
Linaria vulgaris	x	x
Mentha arvensis	x	
Stachys sylvatica		x
Glechoma hederacea	x	
Scutellaria minor	x	
Teucrium chaemaerys		x
Teucrium scorodonia	x	x
Plantago lanceolata	x	x
Plantago major	x	x
Campanula patula	x	
Campanula rotundifolia	x	x
Galium aparine	x	x
Galium verum	x	x
Sambucus nigra	x	x
Lonicera periclymenum	x	
Knautia arvensis	x	x
Senecio jacobaea	x	x
Senecio vulgaris		x
Tussilago farfara	x	x
Petasites hybridus	x	
Filago vulgaris	x	
Achillea millefolium	x	x
Erigeron canadensis (Conyza canadensis)	x	x
Artemisia vulgaris	x	x
Chrysanthemum leucanthemum	x	
C. vulgare (Tanacetum vulgare)		x
Carduus nutans	x	
Cirsium arvense	x	x
Cirsium vulgare	x	x
Centaurea nigra	x	x
Hypochaeris maculata	x	x
Picris hieracoides	x	x
Tragopogon pratensis	x	
Sonchus oleraceus	x	

	Freeland Corner-Drayton	*Drayton-Hellesdon*
Crepis capillaris	x	x
Taraxacum officinale	x	
Juncus effusus	x	
Lolium perenne	x	x
Dactylis glomerata	x	x
Bromus sterilis	x	x
Agropyron repens	x	x
Festuca rubra	x	x
Poa annua	x	
Cynosurus cristatus	x	x
Avena fatua		x
Arrhenatherum elatius	x	x
Aira praecox	x	
Holcus lanatus	x	
Anthoxanthum odratum	x	x
Phleum bertoloni	x	
Phleum pratense	x	x
Agrostis tenuis	x	x
Totals	106	93

THE VEGETATION OF RINGMERE IN AUGUST 1974

by D. E. Coombe, A. F. G. Douse and C. D. Preston

Introduction

The remarkable "Breckland meres" of East Wretham Heath, Norfolk, have long been known to naturalists. The water level in Ringmere, Fowlmere, Langmere and the Devil's Punch Bowl is controlled by the water-table in the underlying chalk, and fluctuates from season to season and from year to year. When the water-table is high the meres can be full or even overflowing; at the other extreme they can be quite dry. This creates conditions in which several rare or local bryophytes (e.g. *Physcomitrium eurystomum*, *Riccia cavernosa*) and vascular plants (e.g. *Alopecurus aequalis*, *Rumex maritimus*) have been found. These meres contrast with some nearby water bodies such as Fen Mere where the water rests on a bed of clay, and its level is thus independent of the short term variations in the water-table (Great Ouse River Authority, 1973).

The effect of variations in rainfall on the water-table and hence on the water level in Ringmere was well illustrated during the period 1968—1974 (Table 1, Fig. 1). The water level in the mere was very high in 1969 and 1970 following the wet years 1968 and 1969. By contrast rainfall was below average in 1972 and 1973, and in late July 1973 Ringmere dried up. The spring of 1974 was also a period of low rainfall, and the mere remained dry until the beginning of December 1974 when free water reappeared following the wet months of August-November.

On 4—6 August 1974 we were able to survey the vegetation of the dry bed of Ringmere. Here we compare the vegetation in 1974 with that reported on other occasions when Ringmere dried out.

Vegetation Survey : Methods

We studied the area of the mere which is submerged during times of exceptionally high water level. This was defined by (1) the presence of adventitious roots on *Salix cinerea* shrubs on the upper banks of the mere, (2) the presence of dead *Betula* and *Pinus sylvestris* and (3) the lower limit of the *Pteridium aquilinum* stand at the western end of the mere. These features probably indicate the extent of flooding in 1969 (see below). Before surveying the vegetation we carried out a simple levelling survey of the bed of the mere. We recorded the height of ground level at intervals of 10 or 20 m on four axes running from a post fixed at the lowest point of the mere (26.80 m above O.D.). These axes had bearings of 78°, 167°, 258° and 348° from magnetic north (7° should be added to each figure to obtain the bearing from true north). We then mapped the vegetation, distinguishing six zones primarily on the

basis of the dominant species. The four axes previously used for levelling, plus a further four between them, were used as reference lines during the mapping. The species in each zone were then listed, and their frequency assessed on the scale: dominant (d), abundant (a), frequent (f), occasional (o), rare (r) and very rare (vr), qualified by "locally" (l) when appropriate.

TABLE 1 (a) Annual rainfall at Grime's Graves (9.5 km W of Ringmere) and Elveden (12 km SW of Ringmere), 1968-1978.
(b) Monthly rainfall at Elveden, 1974.
The mean annual and monthly values for the 20 year period 1959-1978 are given for comparison.

(a) Annual rainfall, 1968-1978 (mm)

	1968	*1969*	*1970*	*1971*	*1972*	*1973*
Grime's Graves	722.6	699.3	646.4	662.6	538.5	531.4
Elveden	776.2	697.5	685.3	691.9	540.5	557.5

	1974	*1975*	*1976*	*1977*	*1978*	MEAN *1959-1978*
Grime's Graves	708.8	583.8	535.1	570.9	719.2	633.4
Elveden	684.5	659.6	562.9	581.2	720.9	628.1

(b) Monthly rainfall at Elveden, 1974 (mm)

	J	*F*	*M*	*A*	*M*	*J*
1974	40.9	65.5	17.3	11.9	21.6	56.4
Mean, 1959-1978	56.1	36.6	41.4	46.0	42.7	52.3

	J	*A*	*S*	*O*	*N*	*D*
1974	39.1	66.0	81.8	129.3	109.7	45.0
Mean, 1959-1978	59.9	56.4	55.6	51.3	69.1	60.7

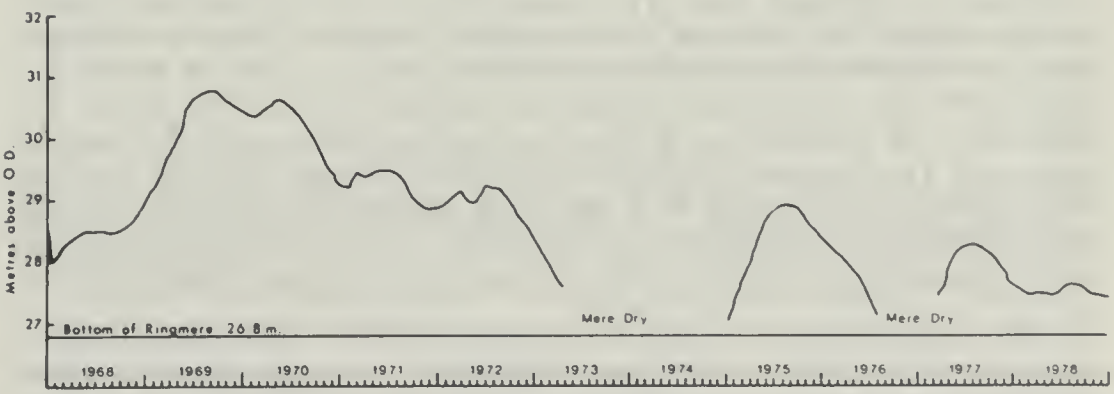


FIGURE 1. The water level at Ringmere, 1968-1978 (from information supplied by the Anglian Water Authority).

Vegetation Survey : Results

FIG. 2 is a vegetation map; FIG. 3 is a profile through the vegetation in the lower part of the mere showing the vertical distribution of the vegetation zones. TABLE 2 lists those species recorded in more than one of the zones; those confined to a particular zone are listed in the text below. Nomenclature of vascular plants follows Clapham, Tutin & Warburg (1962), with the exception of *Rorippa islandica*. The Norfolk plant previously called *R. islandica* should be named *R. palustris* (Swann, 1975).

In the centre of the mere on the almost flat ground was the *Myosoton aquaticum* zone. Here *Myosoton* had a total cover of 90%, and formed a dense flowering sward some 40—50 cm high. Insects (including bees, flies and ladybirds) were frequent visitors to the flowers. *Phalaris arundinacea* was present as non-flowering shoots some 50—60 cm high and with a cover of no more than 5%. Two of the most local plants recorded from Ringmere, *Alopecurus aequalis* and *Rumex maritimus*, were much more abundant in this zone than elsewhere. Only two species were actually confined to the *Myosoton* zone, *Epilobium adenocaulon* (vr) and *Glyceria fluitans* (o), and we found no bryophytes. Three small patches of *Myosoton aquaticum* occurred higher up the bank in hollows in the *Agrostis stolonifera — Polygonum amphibium* zone (see FIG. 2). In the two hollows on the eastern side of the mere *Myosoton* was accompanied by *Phalaris*, and in the third by *Polygonum amphibium* — a species absent from the *Myosoton* zone in the centre of the mere.

The second zone, named after the dominant plant *Phalaris arundinacea*, occurred in a narrow band surrounding the *Myosoton* zone on all except the north-east side. *Phalaris* formed a flowering sward with 95% cover, vegetative shoots 1 m high and inflorescences up to 1.5 m. Although *Myosoton* was abundant the total cover was only 2%, and only three other species were recorded: *Agrostis stolonifera*, *Epilobium hirsutum* (one plant) and *Polygonum amphibium* (non-flowering plants 75 cm high). *Alopecurus aequalis* and *Rumex maritimus* were both absent from this zone, and no bryophytes were found.

On the sides of the mere above these zones was the *Agrostis stolonifera— Polygonum amphibium* zone. The boundary between this and the *Phalaris* zone was abrupt, but there was a more gradual transition from the *Myosoton* zone in some areas where *Phalaris* was absent (FIGS. 2, 3). In the *Agrostis — Polygonum* zone *Agrostis stolonifera* was dominant, with 95% cover. The plants were at anthesis, or at the post-anthesis stage with the panicles contracted. The *Agrostis* inflorescences imparted a brown colour to this zone which contrasted markedly with the green *Myosoton* and *Phalaris* zones. Although *Polygonum amphibum* was abundant (total cover 3%) it was present as non-flowering shoots 20 cm high, and was inconspicuous from a distance.

The height of *Agrostis stolonifera* decreased from 60 cm in the lower part of the zone to 25 cm at the upper edge. *Alopecurus aequalis* was confined to the extreme lower magin of the zone, and seedlings of *Salix cinerea* 70 cm high were locally frequent on the lower boundary. At the same level we also found a single seedling of *Salix* cf *fragilis* (15 cm high) and three *Betula*

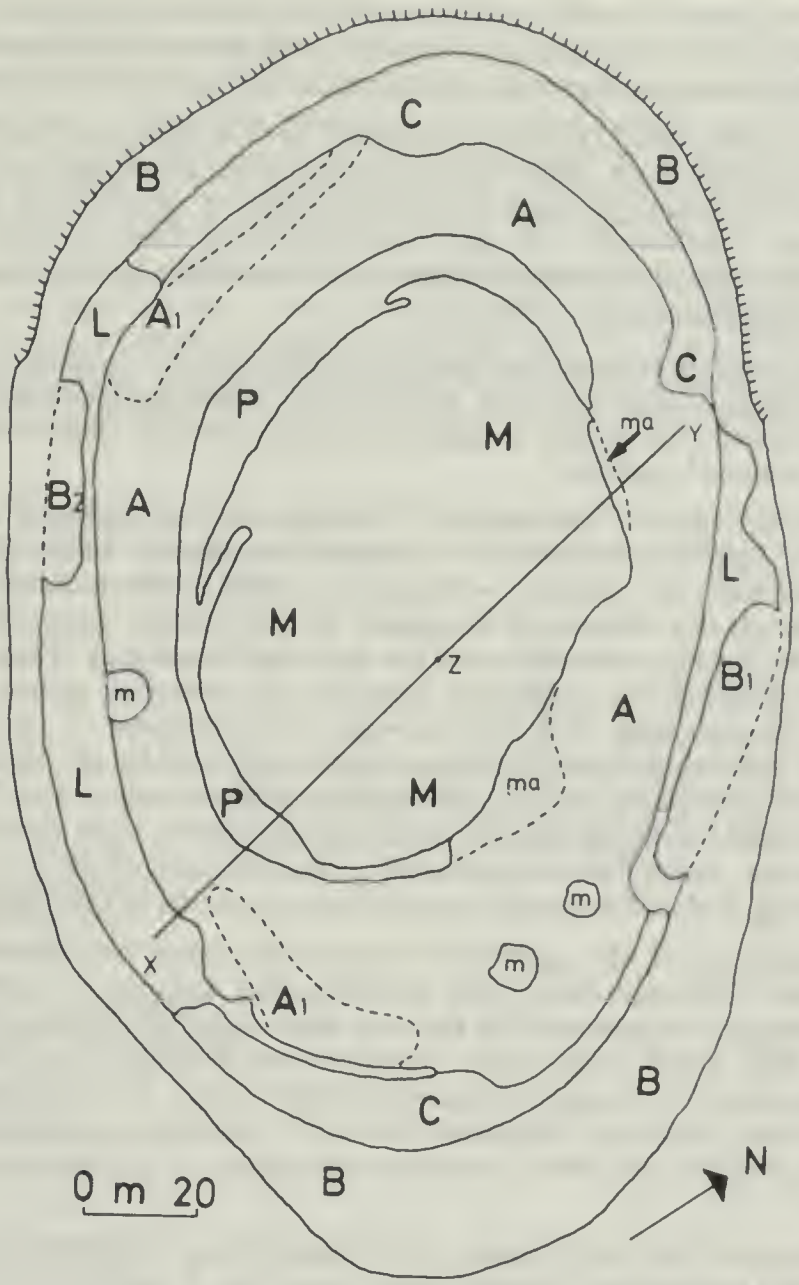


FIGURE 2. Vegetation map of Ringmere, August 1974.

Key: A — *Agrostis — Polygonum* zone; A_1 — *Agrostis — Polygonum* zone with *Holcus lanatus* frequent; B — *Betula* zone; B_1 — *Betula* zone with abundant *Conyza canadensis*; B_2 — *Betula* zone with frequent *Medicago lupulina*; C — *Agrostis — Conyza* zone; L — *Medicago lupulina* zone; M — *Myoston aquaticum* zone; P — *Phalaris arundinacea* zone; m — outlying patches of *Myosoton aquaticum*; ma — transitional zone between M and A. The hatched line indicates the lower border of *Pteridium*. Z is the lowest point of the mere and XY is the basal line of the profile shown in Figure 3. North is magnetic (see text).

pubescens seedlings. By contrast *Holcus lanatus* was more abundant towards the upper edge of the zone, and in places was co-dominant with *Agrostis*. The presence of *Myosoton* in depressions in this zone has been mentioned already.

Signs of rabbit activity were in evidence in this zone, especially on the northern side of the mere. This was in contrast to the *Myosoton* and *Phalaris* zones where there was no such activity apparent. A small stand of *Urtica dioica* on the north-west side may have indicated local eutrophication, possibly on the site of a former wildfowl nest. Elsewhere in this zone *Urtica* was very rare and less than 10 cm high.

The only species recorded exclusively in this zone were *Juncus bufonius* (vr), *Salix* cf *fragilis* and *Trifolium dubium* (vr). *Climacium dendroides* was noted, and we also saw, but did not identify, a small quantity of an acrocarpous moss with dehisced capsules.

Above the *Agrostis stolonifera — Polygonum amphibium* zone we recorded an *Agrostis stolonifera — Conyza canadensis* zone. This was distinguished from the *Agrostis — Polygonum* zone by the reduced cover of *Agrostis*, the greatly decreased frequency of *Polygonum amphibium*, the abundance of *Conyza canadensis* and the increased frequency of many herbs (e.g. *Lotus corniculatus*, *Medicago lupulina*, *Ranunculus repens*, *Sagina nodosa*, *S. procumbens*, *Trifolium arvense*, *T. campestre*, *T. repens* and *Verbascum thapsus*). *Ranunculus repens* was represented by the variant with a characteristic leaf form found in most of the Breckland meres, and *Trifolium repens* had small leaves typical of wild-type plants rather than agriculturally selected strains. *Anthyllis vulneraria* (vr), *Arenaria serpyllifolia* (r), *Erodium cicutarium* agg. (vr) and *Festuca ovina* (vr) were recorded in this zone only.

At approximately the same level around the mere was the *Medicago lupulina* zone. Although floristically similar to the *Agrostis — Conyza* zone it was immediately recognisable by the very dense sward of *Medicago lupulina* which had 90% cover in the zone. In places the *Medicago* was present in stripes along radii of the approximately circular mere. *Conyza canadensis* was absent from this zone. *Odontites verna* (vr), *Ornithopus perpusillus* (vr), *Trifolium hybridum* (vr) and *T. pratense* var *sativum* (vr) were not recorded elsewhere.

At the upper edge of the mere was a *Betula* zone. This was an area of scattered trees and shrubs, including *Betula pendula*, *B. pubescens*, *Crataegus monogyna*, *Ligustrum vulgare*, *Populus alba* (a single tree with suckers around the base), *Quercus robur*, *Salix cinerea*, *Sarothamnus scoparius*, *Ulex europaeus* and *Viburnum opulus*. Some herbs were also much more frequent in this zone then elsewhere, including *Arrhenatherum elatius*, *Chamaenerion angustifolium* and *Urtica dioica*. The *Betula* zone differed from all the other zones in the large number of species, 38 out of the 79 recorded in the zone, which were exclusive to it. These were *Achillea millefolium* (r), *Agrostis canina* sub sp. *montana* (vr), *Arctium* sp. (vr), *Arrhenatherum elatius* (la), *Betula pendula* (la), *Bryonia dioica* (vr), *Carex muricata* agg. (vr), *Centaurium erythraea* (vr), *Crataegus monogyna* (o), *Dactylis glomerata* (vr), *Eupatorium cannabinum* (r), *Festuca rubra* (r),*Galium aparine* (vr), *Glechoma hederacea* (vr), *Heracleum sphondylium* (vr), *Juncus conglomeratus* (f), *J. effusus* (f),

Lactuca virosa (vr), *Lathyrus pratensis* (vr), *Ligustrum vulgare* (o), *Lotus pedunculatus* (f), *Luzula campestris* (vr), *Pastinaca sativa* (o), *Phleum bertolonii* (r), *Pinus sylvestris* (15 dead trees), *Plantago lanceolata* (vr), *Populus alba* (vr), *Prunella vulgaris* (r), *Pteridium aquilinum* (r), *Rhamnus cathartica* (vr), *Rumex acetosella* (o), *Sarothamnus scoparius* (2 bushes), *Sonchus arvensis* (vr), *Stellaria graminea* (o), *Ulex europaeus* (la), *Veronica serpyllifolia* (vr), *Viburnum opulus* (vr) and *Vicia hirsuta* (vr).

Dead trunks of *Betula* were a conspicuous feature of the lower part of the *Betula* zone, especially on the eastern side of the mere, and although we found 15 dead *Pinus sylvestris* we did not observe any live trees. Some *Crataegus monogyna* bushes were also dead, and several *Salix cinerea* shrubs in the lower part of this zone bore mats of adventitious roots on their branches.

TABLE 2. Species recorded in the six vegetation zones identified at Ringmere. Species confined to a single zone are listed in the text, but included in the totals at the foot of the table.

	Myosoton aquaticum zone	*Phalaris arundinacea* zone	*Agrostis stolonifera - Polygonum amphibium* zone	*Agrostis stolonifera - Conyza canadensis* zone	*Medicago lupulina* zone	*Betula* zone
Agrostis stolonifera	o	a	d	a	f	f
Alopecurus aequalis	a		vr		vr	
Betula pubescens			vr		lf	la
Carex hirta			o	f	o	
Cerastium holosteoides			vr			r
Chamaenerion angustifolium				vr	vr	f
Cirsium arvense			r	r	r	o
Cirsium palustre			vr	o	r	f
Cirsium vulgare				r		o
Conyza canadensis	vr			la		o, la
Crepis capillaris	vr		vr	r		
Epilobium hirsutum	vr	vr				o
Epilobium palustre	vr		r	r	vr	o
Epilobium parviflorum	vr		vr		o	
Galium palustre			o	o	o	r
Holcus lanatus	r		f	f	f	a
Juncus articulatus	vr		vr			r
Linaria vulgaris			vr			r
Lotus corniculatus			vr	o	r	vr
Lycopus europaeus	vr		vr			o
Medicago lupulina			o	a	a, ld	o
Mentha arvensis	r		o	f		f
Myosotis arvensis				vr	r	o
Myosoton aquaticum	d	a	r	r	r	r
Phalaris arundinacea	a	d	vr	r	r	o, la
Plantago major			lf	vr	r	
Poa pratensis			lf	r	f	f

Poa trivialis	vr				o	o
Polygonum amphibium		r	a	r	r	r
Potentilla anserina	o		f	f	f	
Potentilla reptans				vr		r
Quercus robur			vr			o
Ranunculus repens			r	f	f	r
Rorippa palustris	vr			o		
Rumex crispus					r	r
Rumex maritimus	f		vr	vr	vr	
Sagina nodosa			vr	o	o	o
Sagina procumbens				o	o	o
Salix cinerea			lf			f
Senecio jacobaea			vr	r	r	o
Senecio sylvaticus					vr	o
Silene alba			vr			vr
Sonchus asper	vr					r
Taraxacum sp.			vr			vr
Trifolium arvense				f	o	
Trifolium campestre			vr	o		r
Trifolium repens			o	f	f	f
Urtica dioica			vr, lf	vr	vr	f, la
Verbascum thapsus				o	r	vr
Veronica scutellata			o	o	o	
Vicia sativa spp. *angustifolia*				vr		r
Total number of species	20	5	39	39	37	79

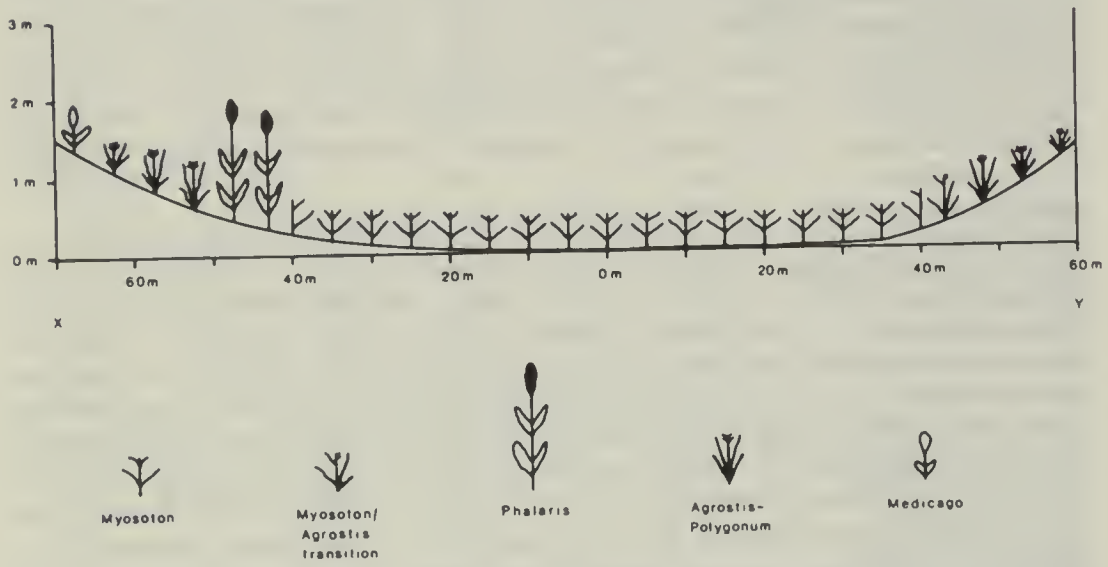


FIGURE 3. Profile through the vegetation in the lower part of Ringmere, August 1974. The position of the profile is shown in Figure 2. The vertical scale is exaggerated ten-fold.

Vegetation Survey : Interpretation

The most striking feature of the vegetation of Ringmere in 1974 was the arrangement of the zones described above in concentric circles around the lowest part of the mere. This is illustrated in FIG. 2. This pattern suggests that the primary factor controlling the vegetation at any level in the mere is the position of the water-table. However, a large number of inseparable aspects of the water regime acting over an unknown period of time before August 1974 might have created the zonation that we observed. Different levels in the mere would differ in the depth of water when they are last submerged, the duration of that submergence, the time of year when they were exposed above the water, the depth of the water-table below the surface after the water receded and the length of time for which they had been exposed. These factors might have a direct effect on the vegetation, or might influence it by the indirect effect on the soil or on animal activity. The previous vegetation at a particular level would also be important in determining the composition of the seed bank in the soil.

Most of the plants which are frequent in the *Myosoton* and *Phalaris* zones are usually found in seasonally or permanently wet habitats. This is not true of both *Agrostis* zones where many of the commoner species are plants of wide ecological tolerance which often occur in damp habitats but are by no means exclusive to them (e.g. *Agrostis stolonifera*, *Potentilla anserina* and *Trifolium repens*). *Polygonum amphibium* is an exception to this generalisation as it is usually found by water or as an aquatic. However, the shoots in the *Agrostis — Polygonum* zone were clearly depauperate—Clarke (1925) describes Langmere when flooded as "filled from end to end with amphibious persicaria, which, when in full bloom, makes a covering of Oriental brilliance and delicacy". On 3 July 1975, when Ringmere was flooded once again, *Polygonum amphibium* was abundant in the water (Trist 1979, p21), and by 27 August it was flowering very abundantly.

The occurrence of *Alopecurus aequalis* and *Rumex maritimus* in the *Myosoton* zone, which occupied the most transient of the Ringmere habitats, is interesting as these species are known to be erratic in their appearance and fluctuate in numbers from year to year (Lousley 1939, Grose 1942, Salisbury 1970). In contrast to *Polygonum amphibium*, which can persist through unfavourable (dry) periods as vegetative shoots, these species survive unfavourable (flooded) periods as seeds.

None of the species we have listed from the mere is a strict calcicole. By contrast *Bromus erectus* and *Centaurea scabiosa*, which are confined to calcareous soils, occur on chalky road metal beside the old road (now a lay-by) near the mere.

The *Betula* zone marks the extreme upper limit of flooding. The trees and shrubs of this zone provide a more permanent record of the effect of changes in water level than the herbaceous vegetation below. The adventitious roots of *Salix cinerea* must have been formed at a time of high water level when these shrubs were partially submerged. The dead *Pinus sylvestris* and *Betula* were almost certainly killed at the same time. These remains are those of the trees which germinated after the reduction of the rabbit population by myxomatosis, were mapped by Garrod in 1959 and then killed by the very high

water levels in Ringmere in 1969 (Garrod 1971; Watson 1974). The lower limit of bracken on the western side of the mere (FIG. 2) is probably a further indication of the level the water reached then. Unfortunately all fifteen pine saplings which we observed in 1974, and most of the old sallows, had been removed by 1980, although some of the boles of the birches killed in 1969 were still visible among the saplings which have sprung up since then.

The *Populus alba* that we recorded was the same tree, with its surrounding suckers, that Garrod mapped and that was struck by lightning in July 1959. The tree has completely recovered from the lightning strike, although in 1980 the fissure in its bark was still visible.

The absence of *Alnus* from Ringmere is noteworthy in view of its abundance around Fowlmere, where it shows adventitious roots in times of flooding. The species regenerates in the area, as in 1980 saplings were abundant on Thompson Common, on ditch dredgings perhaps dug out in the very wet spring of 1975.

Comparison of the 1974 Vegetation with earlier Records

Clarke (1903, 1925) has summarized the early records of the vegetation of the dry bed of Ringmere. In 1859 "nettles of gigantic size grew in the bed of the mere". Ringmere next dried out completely in September 1901 and, although the mud "had not become grass-grown" in May 1902, by the following September "the bed of Ringmere was filled with a closely-matted growth from a foot to eighteen inches in height of spotted persicaria [*Polygonum persicaria*] and curled dock *[Rumex crispus]*, while on the old shores were scorpion grass *[Myosotis]* and golden water dock *[Rumex maritimus]* in abundance" (Clarke 1903). The account of the same vegetation by Clarke (1925) differs in that the closely-grown mat is described as composed of "nettles, thistles, persicaria and curled dock".

The delightful but little known book *The Land of the "Babes in the Wood"* by Charles Kent (1913) includes excellent Jarrold photographs of Ringmere and the Punch Bowl : the latter can be dated to 1909 as it shows a cultivation enclosure, and children from the neighbouring cottages, as described by Clarke (1925, p87).

Garrod (1971) gives the first detailed account of the vegetation of Ringmere. After the exceptionally dry summer and autumn of 1959 the water level in the mere fell, and Garrod describes both the vegetation of the mere when it contained water in 1959 and that of the dry bed in 1960. *Phalaris* was abundant in the mere before it dried up, and, although it became temporarily covered by a dense layer of *Leptodictyum riparium* soon after the water receded in October 1959, it remained dominant. "By high summer . . . . in the centre (of the mere) *Phalaris* was waist high and in flower, choking all other species except in two small areas .... dominated by orange foxtail *(Alopecurus aequalis)*, and here were found almost all the plants of the dry phase. Away from the centre in areas which had been early to dry out fine bent *(Agrostis tenuis)* . . . . gave colour and water chickweed *(Myosoton aquaticum)* was locally dominant in its dense pale-green patches. *Phalaris*, shorter, less dense, and generally not in flower occupied much of the remainder of the bed".

One would not expect the vegetation of Ringmere to be identical on each occasion on which it dried out as the water would fall in different seasons and at different rates. However the report of gigantic nettles in 1859 is not matched by any later record. This information was given to Clarke (1903) by an old shepherd and it would be unwise to make too much of it, but it is possible that the practice of using the meres as a watering place for flocks of sheep, and the large rabbit population (both described by Staniland, 1887), led to high nutrient levels and intense grazing pressure which would favour the growth of nettles.

The *Polygonum persicaria — Rumex crispus* mat described from the mere in 1902 also differs from the vegetation of the mere in 1960 and 1974. *Polygonum persicaria* — an annual species in contrast to the perennial *P. amphibium* — was also the most abundant species on the uncultivated parts of the dry bed of Fowlmere in 1902 (Clarke 1903). It occurs in the same habitat in Langmere (Clarke 1925) and in 1960 Garrod listed it as occasional on the dry bed of Ringmere. Its absence in 1974 is noteworthy, especially as in 1973 Watson (1974) found that it was abundant.

The account of the vegetation of Ringmere in 1960 (Garrod 1971) shows that it was similar to that in 1974 in the presence of *Phalaris*, although *Alopecurus aequalis* and *Myosoton* appear to have covered a greater area in 1974 than in 1960. The greatest difference, and one that ecologically is not easy to understand, is that *Agrostis tenuis* was abundant away from the centre of the mere in 1960, whereas in 1974 *A. stolonifera* played a similar rôle. Because the species of *Agrostis* can be troublesome to identify D.E.C., accompanied by P.J.O. Trist, checked the identity of the Ringmere plants on 27 August 1975. Although *A. tenuis*, not recorded at all in the 1974 survey, was found in the *Betula* zone near the entrance to the mere from the road there was no doubt that all the other *Agrostis* above the water level was *A. stolonifera* or (in the *Betula* zone only) *A. canina* ssp. *montana*. Plants of *A. stolonifera*, still green, were also seen under the water.

A comparison of the species listed from Ringmere by Garrod with our species lists shows that a number of plants recorded as occasional on the dry bed of the mere in 1960 were absent in 1974 (e.g. *Chenopodium rubrum*, *Hippuris vulgaris*, *Myosotis scorpioides*, *Ranunculus aquatilis* and *Triglochin palustris*). We probably missed some of these species because they are spring flowering annuals (e.g. *Myosotis discolor*, *M. ramosissima*, *Teesdalia nudicaulis*); others he included, such as *Bromus erectus*, occur in the very disturbed, highly calcareous roadside grassland above the 1969 flooding limit, and outside the present (1980) fence. Several of the species recorded by Garrod in Ringmere but not by us we have seen in other meres, notably *Rorippa amphibia*, *Myosotis caespitosa* and *M. scorpioides*.

Schoenoplectus lacustris (rare) and *S. tabernaemontani* (occasional) were both present in the water margin community in 1959, although by 1960 only *S. lacustris* was listed (as rare) by Garrod on the dry bed of the mere. We did not record either species in our 1974 survey. They were probably eliminated from the mere during a period (in 1959 or subsequently) when it was dry. At the Punch Bowl in 1974 we were able to compare the diameter of living stems of *S. lacustris* on the dry bed of that mere with that of the previous years' stems then present as dead remains. The 1974 stems were much more slender

than those older stems which grew when the water level was higher. In 1975 when the plants were again standing in water they were much taller than they had been the previous year.

In 1980 we noticed that a small patch of vigorous *S. lacustris* had re-appeared on the north-east side of Ringmere, but we could find no *S. tabernaemontani*. Indeed all the *Schoenoplectus* that we saw in 1980 both in the mere with concentric ditches east of Ringmere and in the Punch Bowl was *S. lacustris*. There was also, in 1980, a small patch of *Sparganium erectum* in Ringmere — this grows with *Acorus calamus* in the deep roadside mere between Ringmere and Langmere.

The scarcity of bryophytes in 1974 is noteworthy, and is in marked contrast to the two inches thick blanket of *Leptodictyum riparium (Amblystegium riparium)* in 1959-60.

There is a group of species which were not listed by Garrod either from the dry bed of the mere in 1960 or from the grass community recorded on the parts of the bank above water level in 1959. This group includes *Conyza canadensis*, *Plantago major*, *Sagina procumbens* and *Veronica scutellata*. However Jones and Lewis (1941), in a primarily hydrological paper, mapped a zone of *Conyza* (as *Erigeron canadense)* on the upper part of the bank around Fowlmere in a position which corresponds very closely to the area in which *Conyza* was locally abundant in Ringmere in 1974. Jones and Lewis' map was made in the 1930's when the water level in Fowlmere was falling, and Jones states that the belt of *Conyza* "undoubtedly represented a stage in the falling water-level when the seeds of this weed were deposited on the soil". A further parallel with Ringmere in 1974 is the line of *Salix cinerea* seedlings that Jones and Lewis mapped midway down the Fowlmere bank. The presence of these seedlings at times of low water level emphasises the importance of the fluctuations in water level in maintaining conditions in which species of open habitats can survive.

Acknowledgements

We are grateful to the warden of the East Wretham Nature Reserve, Capt. R. L. Marriott, R.N., for permission to carry out this survey and to his successor, Mr P. Steele, for help during the preparation of this account. We also thank the Elveden Estate office and the Forestry Commission, Santon Downham, for making their rainfall data available to us, and the Anglian Water Authority for providing water level data. R. A. Watson kindly allowed us to quote his unpublished report of work undertaken at the University of East Anglia and financed by the Nature Conservancy Council.

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SOME NORFOLK GALL MITES (ACARINA: ERIOPHYIDAE)

by S. A. MANNING

Eriophyid mites are minute animals that are barely visible to the naked eye, the largest British species being only 270 microns long. The smallest animals with an external skeleton, they breathe directly through the skin and, unlike the majority of mites, possess only two pairs of legs. Most of them are associated with perennial host-plants, feeding mainly on the soft, young, green tissue.

These mites, whose life-cycle may take as little as ten days when weather conditions are suitable, lay eggs, which give rise to two nymphal stages and finally the adult egg-laying state. They are capable of spreading to other parts of the same plant or to other plants either by crawling or by bending their bodies and springing ("leaping"), but many are dispersed by rain or by being transported by other animals, notably insects.

Many of the Eriophyidae are free-living, but other species cause galls, striking examples of which appear on the leaves of lime trees as "nail" or tintack" galls and as erineum galls, felts of abnormal hairs resembling patches of mildew.

The following list, the result of casual, rather than intensive, collecting since 1949, is concerned with gall-causers, whose names are mostly those used by Buhr (1964-65). Like Eriophyidae generally, they are remarkably host-specific and it is therefore convenient to arrange the list in the alphabetical order of host-plant genera, plant names being those used by Clapham, Tutin and Warburg (1973). The appropriate vice-county number is inserted before each list of localities, East Norfolk (27) being separated from West Norfolk (28) by the line of longitude 1° E.

Acer campestre L. Field Maple.

Aceria eriobia eriobia (Nal.). Erineums on leaves. 27: Old Buckenham, 1950; Norwich, 1955; Brooke Wood, 1980; Intwood, 1980: 28: Swaffham, 1980.

A. macrochela macrochela (Nal.). Leaf galls in vein-axils. 27: Old Buckenham, 1950; Spixworth, 1950; Norwich, 1954; Brooke Wood, 1980; Haveringland, 1980; Hellesdon, 1980. 28: Caston, 1952; Swaffham, 1980.

A. macrorrhyncha cephalonea (Nal.) f. *aceris campestis* (Nal.). Numerous galls on leaf upper surface. 27: Old Buckenham, 1949; Spixworth, 1950; Sutton, 1952; Norwich, 1954; Ringland, 1964; Intwood, 1980; Haveringland, 1980; Brooke Wood, 1980; Felthorpe, 1980; Alderford Common, 1980. 28: Wilby, 1951; Caston, 1952; Shropham, 1952; Titchwell, 1971; Swaffham, 1980.

Acer pseudoplatanus L. Sycamore.

A. macrorrhyncha (Nal.). Numerous "pimple" galls on leaf upper surface. 27: Drayton, 1949; Old Buckenham, 1949; Norwich, 1951; Hethersett, 1968; Hellesdon, 1980; Felthorpe, 1980; Cromer, 1980; Dunston, 1980. 28: Caston, 1951; Sandringham, 1964; Titchwell, 1971.

A. pseudoplatani (Corti). Erineums on leaves. 27: Old Buckenham, 1949; Norwich, 1955; Hethersett, 1968; Cromer, 1980; Intwood, 1980. 28: Caston, 1952; Thompson Water, 1952; Titchwell, 1971.

Aesculus hippocastanum L. Horse-chestnut.

A. hippocastani (Fockeu). Clusters of brown hairs forming erineum galls at axils of leaf veins; also along mid-rib of leaf under surface. 27: Sutton, 1952.

Alnus glutinosa (L.) Gaertner. Alder.

A. brevitarsa brevitarsa (Fockeu). Erineums on leaves. 27: Old Buckenham, 1949; Wheatfen Broad, 1950; Hellesdon, 1980. 28: Caston, 1952; Shropham, 1951; East Harling Common, 1951.

Eriophyes inangulis (Nal.).Galls in the axils of the primary offshoots of the main rib of the leaf; in pairs on upper surface. 27: Crostwick Common, 1950; Old Buckenham, 1950; Wheatfen Broad, 1950; Drayton 1951; Sutton, 1952; Norwich, 1954; Burgh next Aylsham, 1980; Intwood, 1980; Felthorpe, 1980; Hellesdon, 1980. 28: East Harling Common, 1951; Shropham, 1951; Caston, 1952; Foulden Common, 1970.

E. laevis laevis (Nal.). Raised "pimple" galls on leaf upper surface. 27: Wheatfen Broad, 1950; Drayton, 1951; Crostwick, 1951; Old Buckenham, 1951; Norwich, 1955; Burgh next Aylsham, 1980; Felthorpe, 1980. 28: East Harling Common, 1951; Shropham, 1951; Caston, 1952; Watton, 1952; Foulden Common, 1970.

Artemisia vulgaris L. Mugwort.

Aceria artemisiae artemisiae (Can). Galls on leaves. 27: Costessey, 1951; Felthorpe, 1980.

Betula pubescens Ehrh. Birch.

A. calycophthira (Nal.). "Big buds". 27: Old Buckenham, 1950; Sutton, 1952; Felthorpe, 1980; Norwich, 1980. 28: Thompson Water, 1952.

A. leionota (Nal.). *See Betula ¦pendula* Roth.

A. rudis rudis (Can.). Erineums on leaves. 27: Banham/Quidenham, 1951; Sutton, 1952; Felthorpe, 1980; Norwich, 1980; Dunston, 1980. 28: Foulden Common, 1970.

Eriophyes longisetosus Nal. Leaf galls. 27: Old Buckenham, 1950; Felthorpe, 1970; Norwich, 1980: 28: Foulden Common, 1970.

Betula (¦pendula Roth). Silver Birch.

Aceria leionota (Nal.). "Pimple" galls on leaves. 27: Felthorpe, 1980.

Carpinus betulus L. Hornbeam.

A. macrotricha (Nal.). Crooked and folded lateral leaf-veins. 27: Old Buckenham, 1951.

A. tenella (Nal.). Small swellings in angles between midrib and main veins. 27: Old Buckenham, 1951.

Chrysanthemum vulgare (L.) Bernh. Tansy.

A. tuberculata tuberculata (Nal.). Leaf edge rolling upwards. 27: Burgh next Aylsham, 1980.

Corylus avellana L. Hazel.

Phytoptus avellanae Nal. "Big buds" on young shoots. 27: Old Buckenham, 1951; Norwich, 1954; Felthorpe, 1980; Felbrigg, 1980. 28: Caston, 1951; Swaffham, 1980.

Crataegus, Hawthorn.

Eriophyes goniothorax Nal. Marginal roll galls on leaves. 27: Wheatfen Broad, 1950; Banham-Quidenham, 1951; Crostwick, 1951; Old Buckenham, 1951; Drayton, 1952; Sutton, 1952; Norwich, 1954; Felthorpe, 1980; Brooke Wood, 1980; Intwood, 1980; Haveringland, 1980; Burgh next Aylsham, 1980; Dunston, 1980; Cromer, 1980; Felbrigg, 1980. 28: Shropham, 1951; East Harling Common, 1951; Caston, 1951; Shipdham, 1952; Foulden Common, 1970; Titchwell, 1971; Weeting-with-Broomhill, 1980; Swaffham, 1980; Hempton, 1980.

E. piri crataegi Nal. Raised "blister" galls on both leaf surfaces. 27: Crostwick, 1950; Old Buckenham, 1951; Drayton, 1980; Felthorpe, 1980; Norwich, 1980; Burgh next Aylsham, 1980. 28: Caston, 1952.

Euonymus europaeus L. Spindle-tree.

E. convolvens (Nal.). Marginal roll galls on leaves. 27: Wheatfen Broad, 1950; Crostwick, 1950; Banham-Quidenham, 1951; Old Buckenham, 1950.

Fagus sylvatica L. Beech.

Aceria nervisequa faginea (Nal.). Leaf galls. 27: Old Buckenham, 1950; Banham-Quidenham, 1951; Norwich, 1954; Stratton Strawless, 1980; Drayton, 1980.

A. nervisequa nervisequa (Can.). "Filzgalls" on lateral veins. 27: Stratton Strawless, 1980; Drayton, 1980; Felthorpe, 1980.

A. stenaspis plicans (Nal.). Folding of part of leaf. 27: Old Buckenham, 1950; Trowse Newton, 1955.

A. stenaspis stenaspis (Nal.). Marginal roll galls on leaves. 27: Old Buckenham, 1950; Stratton Strawless, 1980; Drayton, 1980; Norwich, 1980. 28: Caston, 1952.

Fraxinus excelsior L. Ash.

A. fraxinivora (Nal.). Inflorescence gall. 27: Norwich, 1951; Old Buckenham, 1951; Ranworth, 1980. 28: Caston, 1951; Fakenham, 1980.

Galium aparine L. Goosegrass.

Cecidophyes galii (Karp.). Leaf-edge rolling and curling. 27: Crostwick, 1950; Old Buckenham, 1950; Drayton, 1951; Norwich, 1954. 28: Caston, 1952; Foulden Common, 1970; Warham, 1971.

Galium verum L. Lady's Bedstraw.

Aceria galiobia (Can.). Pyriform-conical galls on stems, at base of lateral shoots. 27: Drayton, 1951. 28: Shropham, 1952.

Juglans regia L. Walnut.

A. erinea (Nal.). Leaf gall: Walnut Erineum Mite, Walnut Blister Mite. 27: Old Buckenham, 1949; Sutton, 1952. 28: Caston, 1952.

Populus tremula L. Aspen.

Phyllocoptes populi Nal. Leaf galls. 27: Old Buckenham, 1951; Felthorpe, 1980.

Prunus domestica L. Plum.

Eriophyes similis similis (Nal.). Pouch-shaped leaf-galls. 28: Caston, 1952.

Prunus spinosa L. Blackthorn.

E. padi prunianus Nal. Roundish or club-shaped pouch-galls on leaves. 27: Crostwick, 1980.

E. similis pruni spinosae Nal. Pouch-shaped leaf-galls. 27: Crostwick, 1950; Old Buckenham, 1950; Banham, 1951; Sutton, 1952; Norwich, 1955, Ringland, 1964; Intwood, 1980; Felthorpe, 1980; Alderford Common, 1980. 28: Caston, 1951; Foulden Common, 1970; Titchwell, 1971; Swaffham, 1980.

Pyrus, Cultivated Pear.

E. piri piri (Pgst.). Leaf gall: Blister Mite. 27: Old Buckenham, 1950.

Ribes nigrum L. Black Currant.

Cecidophyes ribis (Westw.). "Big buds" on new growth. 27: Old Buckenham 1950. 28: Caston, 1952.

Salix alba L. White Willow.

Aceria truncata (Nal.) and *A. tetanothrix* (Nal.). Galls on leaf margin. 27: Drayton, 1950; Old Buckenham, 1950; Norwich, 1951; Sutton, 1952; Hellesdon, 1980. 28: Caston, 1952.

A. tetanothrix (Nal.), *A. salicina* (Nal.) and *Eriophyes triradiatus* Nal. Galls on leaf-blade. 27: Hellesdon, 1980.

Salix caprea L. Great Sallow.

?*Aceria tetanothrix* (Nal.). 27: Felthorpe, 1980.

Salix cinerea L. agg. Common Sallow.

A. tetanothrix (Nal.). leaf gall. 27: Spixworth, 1950; Crostwick, 1951; Sutton, 1952; Felthorpe, 1980. 28: East Harling Common, 1951; Foulden Common, 1970.

Sambucus nigra L. Elder.

Epitrimerus trilobus (Nal.). Leaf-edge rolling upwards. 27: Banham-Quidenham, 1951; Old Buckenham, 1951. 28: Caston, 1951; Shropham, 1952.

Sorbus aucuparia L. Rowan.

Eriophyes sorbi (Can.). Leaf pustules. 27: Old Buckenham, 1950; Felthorpe, 1980; Norwich, 1980. 28: Thompson Water, 1952.

Taxus baccata L. Yew.

Cecidophyes psilaspis (Nal.). "Big buds" on young growths. 27: Old Buckenham, 1950.

Thymus praecox Opiz ssp. *arcticus* (Durand) Jalas. Wild Thyme.

Aceria thomasi (Nal.). Malformation of flowers and leaves. 28: Bridgham Heath, 1968.

Thymus pulegioides L. Larger Wild Thyme.

Aceria thomasi (Nal.). Malformation of flowers and leaves. 28: Foulden Common, 1970.

Tilia, Lime.

Eriophyes exilis (Nal.). Galls in angles between larger veins. 27: Old Buckenham, 1950; Norwich, 1980; Cromer, 1980. 28: Caston, 1951.

E. leiosoma (Nal.). Erineum galls on leaf. 27: Old Buckenham, 1950; Norwich, 1955, 1980.

E. tiliae tiliae (Pgst.). "Nail" or "tintack" galls on upper surface of leaf. 27: Old Buckenham, 1949; North Walsham, 1952; Norwich, 1952; Cromer, 1980. 28: Caston, 1951; Didlington Park, 1964.

Ulmus, Elm.

Aceria ulmicola ulmicola (Nal.). "Nail" or "tintack" galls on upper surface of leaf. 27: Old Buckenham, 1950. 28: Oxborough, 1950.

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DEVELOPMENTS IN A DRAINED SALT PAN AT WELLS

by P. R. BANHAM

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In a previous article, *Some Studies in the Ecology of Salt Pans* (Trans. N. & N. N.S.., Vol. 23 part 3, 1975) I described the changes which had taken place in a salt pan from when it was drained (30th May 1970) to the end of 1972. As ten years have elapsed since the experiment began, it may be appropriate to report developments.

The purpose of the experiment was to record the re-colonisation of mud forming the floor of a salt marsh pool or "salt pan" when it ceased to be permanently covered by sea-water. For this purpose, a roughly circular pan of the "residual" type was selected, from which a short channel was dug to a nearby minor creek. No plants grew in the mud in 1970, while in 1971 and 1972 the dominant species were *Salicornia europaea* agg. and *Suaeda maritima*, which are the only annuals amongst the seventeen species of seed-plants occurring on that marsh, with a scattering of *Puccinellia maritima* and *Aster tripolium*.

In June 1980 a survey showed that only about 2.7 square metres, 21% of the total area of 13 square metres, was still bare mud (marked "B" in the diagram), with scattered seedlings of *Salicornia*. As might be expected, these remaining areas of bare mud are the lowest parts of the pan, which stay flooded, or at least waterlogged, during spring tides, though often drying out during neap tides. The floor of the pan is about 2.5 metres above mean sea level — a height reached by most spring tide sequences in Wells.

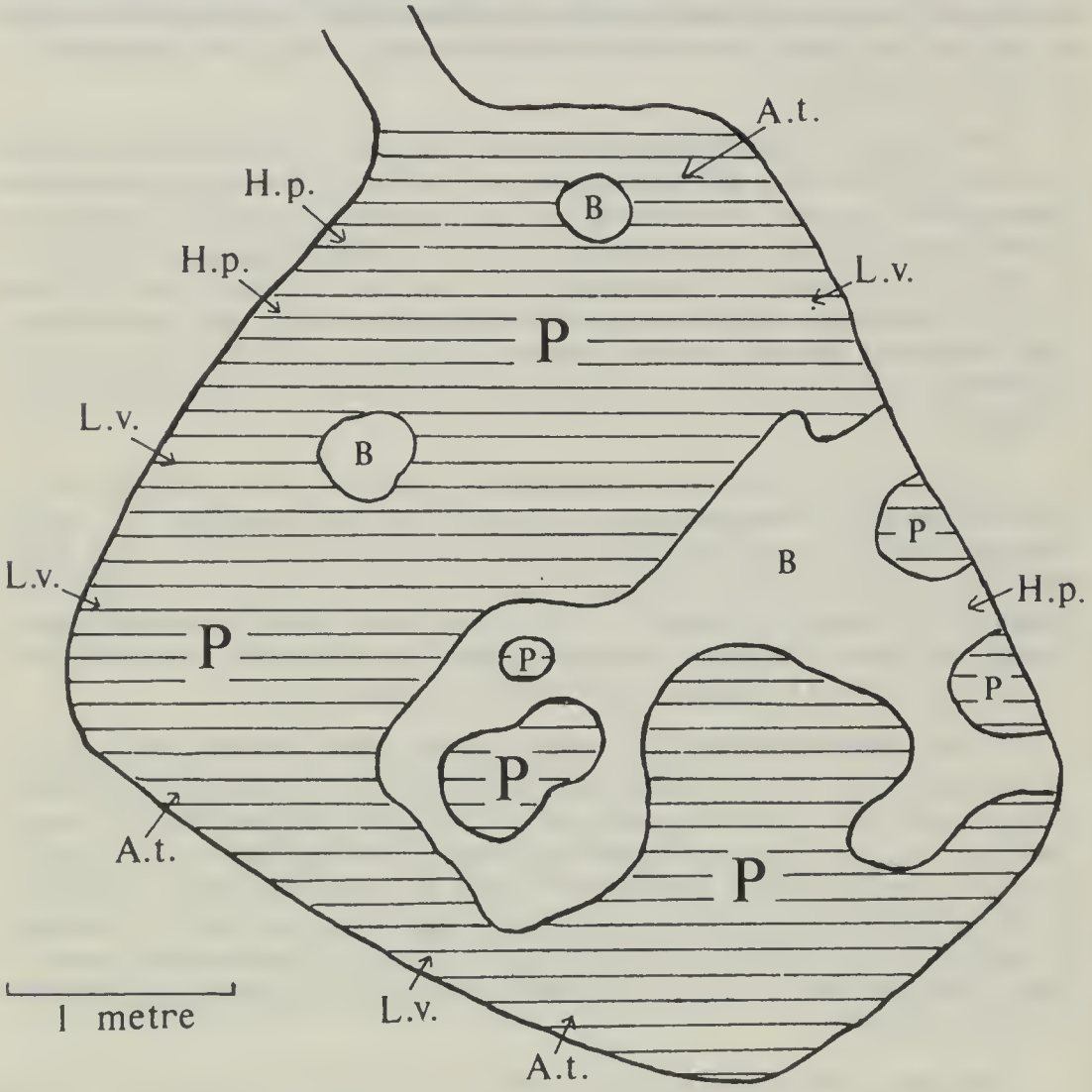
Of the approximately 10.3 square metres (79%) covered with plants, the dominant species is *Puccinellia*, the perenniating clumps often forming a continuous turf. The areas affected ("P" in the diagram) include many seedlings of *Salicornia* and *Suaeda maritima*. The distribution of plants of *Halimione portulacoides, Limonium vulgare* and *Aster tripolium* is indicated by the appropriate initials. It will be seen that these are mainly marginal, though growing at the level of the floor of the pan. The abundant plants of the surrounding marsh are not included in the sketch, although many of them overhang the edge.

Comparing this former salt pan with others not far away which have been drained by natural changes, and whose precise history is not known, the greatest difference is that most of the latter have assumed a saucer-like cross section, presumably owing to the deposition of silt around the edges. Whether this is a function of the time elapsed since drainage or has some other explanation remains to be seen, but there is certainly little sign of it having occurred in the ten years of our experiment.

Plants mentioned in text

Aster tripolium L.	Sea Aster
Halimione portulacoides (L.) Aell.	Sea Purslane
Limonium vulgare Mill.	Sea Lavender
Puccinellia maritima (Huds) Parl.	Salt Marsh Grass
Salicornia europaea L. agg.	Marsh Samphire, Glasswort
Suaeda maritima (L.) Dum.	Annual Seablite

The drained Salt Pan in June 1980



A NEW MOSS FOR NORFOLK

by R. P. Libbey & E. L. Swann

One of us (RPL) joined the Brit. Bryol. Soc., excursion in November 1980 and at Bix Bottom Nature reserve in Oxfordshire *Bryum flaccidum* Brid., was found in serveral places, notably in the fissures of elder bark and round the bases of several small trees, admixed with other bryophytes. The appearance of this moss immediately reminded RPL of the plants we both collected in Horse Wood, Mileham, West Norfolk, in 1977 and which we both tentatively called *Bryum capillare* Hedw., var. It was growing on ash and re-examination has shown this to be *B. flaccidum*. Mr M. O. Hill, Moss Recorder for the Brit. Bryol. Soc., confirmed our gathering, accepting the record as new to West Norfolk and remarking "It is a curious species, and I very much agree that one would call it *B. capillare* var., but for the fact that it seems quite constant in its characters".

Although originally described as a segregate of *B. capillare* as long ago as 1826 it has only recently been recorded in Britain and there is little doubt that it will be found to be a frequent epiphyte.

It is Close to *B. capillare* but distinctive in the filamentous gemmae and decurrent leaves" (Smith, 1978). Dixon (1954) gives it varietal status as var. *flaccidum* B. & S., but he makes no mention of the characteristic axillary gemmae; he describes it as "rare, in moist, sheltered places". We confirm the habitat finding it in the shade of woods and pits where the humidity is high and its frequency on elder is due to the soft bark readily absorbing moisture thus providing it with nutrient salts and the bark itself gives a more or less neutral reaction. Braithwaite (1888-1895) evidently observed the gemmae as he describes var. *flaccidum* Schimp., "often with axillary chlorophyllose brood-filaments". The gemmae are easily detected with a lens in the field.

Re-examination of gatherings in the past has revealed it occurring on the base of ash, Marham Fen, West Norfolk, in 1956 in Herbm. Swann; on elder, Long Plantation, Narborough Field, West Norfolk, in 1957, in Herbm. Swann. More recently we have found it on elder, Hercules Wood, Blickling, East Norfolk, 1980, and abundant in a deep pit on elder, Westacre, West norfolk, 1980.

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MULLEIN MOTHS AND SAWFLIES

by R. E. Evans

Dark Mullein plants *(Verbascum nigrum)* in my garden at Welborne, Norfolk, are visited annually by Mullein Moths *(Cucullia verbasci)* whose colourful larvae soon become conspicuous on the dark green leaves. Clearly, they would be much less obvious on woolly leaves of the Great Mullein *(V. thapsus)*, with their greenish white ground colour, yellow body rings and black spots.

Their colouring does not protect them from all predators, as a house sparrow has been seen to pick off and eat one of the larvae. They have another defence, when alarmed, by wriggling violently and falling to the ground. Several of these larvae were kept until fully grown and duly pupated in the soil. One pupa was attacked by a parasitic fungus, which produced white tufts growing out of the ground. Two larvze collected when almost full grown fell victims to Tachinid flies, five in all emerging from them. Some of the larvae were found also feeding on Yellow Figwort *(Scrophularia vernalis)*.

In early September I noticed some larvae similar in colour to those of the *Cucullia* feeding on the *Verbascum* leaves. They proved to be those of the Mullein Sawfly *(Tenthredo scrophulariae)*. When the time for pupation approaches, these larvae moult and become greenish brown in colour; after burrowing in the soil below, they assume the pupal state, the adult insects being due to emerge in the following year.

MELANISM IN LARVAE OF THE PALE TUSSOCK MOTH *DASYCHIRA PUDIBUNDA*

by R. E. Evans

Larvae of the Pale Tussock Moth are usually illustrated as green or yellowish, with thick white or yellowish brushes on the back and a long tuft of reddish hairs at the rear; there are black rings between the brushes and black spots on the sides of the hind rings. Some time ago I reared a female moth from a normal larva, releasing it in the garden, where it laid a batch of eggs. When larvae from these eggs were about three quarters of an inch long, a change of colour took place following a moult, the thick brushes becoming smoky brown and the "tail" tuft becoming brown instead of red, while considerably more dark hairs appeared elsewhere on the body. Following further moults, much variation was seen, some larvae appearing almost black; but the final appearance just before pupation was lighter. Several generations of the moths were reared subsequently by in-breeding, but no examples of "normal" colouration appeared, all larvae being darker to some degree. Batches of larvae were reared on different food plants, including leaves of *Salix caprea*, *Salix alba*, *Quercus robur* and *Rosa* sp. Different batches were reared in the dark and in the light. From these experiments it was found (1) That the lightest coloured larvae developed on a diet of *Salix alba* and (2) that the larvae grew faster, pupated earlier and were lightest in colour when reared in the dark. It was further that slow-growing larvae were darker and that the colouring of the moths was unaffected by melanism in the larvae.

1980 WEATHER SUMMARY

by T. B. NORGATE
Norfolk Rainfall Organisation

January. The year began with a relatively dry month, being the driest January since 1973 and 1974 and was mostly about 75% of the average. Amounts were higher towards the coast where N. and NE. winds brought moist air in from over the sea. These were chilled over the colder land and becoming super-saturated it resulted in rainfall.

Sunshine was especially high and it was the sunniest January for over 20 years. The number of hours recorded at Morley, over 72 hours was 172% of normal.

Despite the sunshine, the mean temperature was about 2°C below the average of nearly 4°C (39°F). Both air and ground frosts were recorded 50% more often than usual, the latter occurring on 26 nights. It was cold enough for snow to fall on 9 days — double the average — but it never reached any depth. (The 14th was the coldest Jan. day for 33 years in Suffolk).

February. Rainfall was mostly about 10% above normal in the centre of the county and more still on high ground overlooking the North Sea. Snow fell on the first of the month but was too wet to remain very long. Most of the month's precipitation fell during the first week. Mean temperature of 5.33C (41½°F) was as much above normal as it was below in January. The number of frosts was rather below average and it was the mildest February since 1961. Sunshine was on the low side, i.e. just under 50 hours which is about 80% of normal. There were 11 days that were completely sunless, mostly early in the month.

March. Rainfall was mostly above normal especially in N.W. parts of the county where amounts were double those recorded in the south and east. The mean temperature was lower than that for February but less than ½°C below the average of 5.3°C (41½°F). However there were only 13 ground frosts which is 4 less than usual but some were moderately severe and down to -7.7°C (18°F) on the 27th. Sunshine, as in February, was lower than usual with a drop 24 hours from the average figure of 108. Most of the loss occurred in the middle of the month where there were 5 consecutive days without a glint of sunshine.

April. This month was much brighter with only one sun-less day. The total hours of sunshine was over 170 or 20% in excess of the usual and reaching double figures on 8 days. Despite 14 days (or nights rather) with ground frosts, the mean temperature was ½°C above the normal of 7.4°C (just over 45°F). The maximum shade temperature exceeded 20°C (68°F) n 3 consecutive days in the middle of the month. However 14 ground frosts, down to -5.4°C (22.3°F), lowered the overall figure. Rainfall was only 60% of the average of

47.5 mm (1.78") and consisted of 13 days with something to measure. But no amounts were larger than 4.2 mm (.17") in one day, in central Norfolk. Hail fell once, on the 19th, the first time this year so far as the writer recorded.

May. Itwas yet another sunny month, with only one completely dull day, the last. The total number of hours recorded at Morley was 261 which was 40% in excess of normal. Despite this, the mean temperature of just over 10.2°C (50½°F) was a full 1°C below the usual. Clear skies which gave the high sunshine gave clear nights and therefore frosts. There were 8 nights with ground frosts, double the normal for May. The month started off with a three-week drought and the total rainfall varied from 3.3 mm (.13") south of Norwich to 27.2 mm (1.07") in the N.W. corner of the county. Claims were made that it was the driest May this century. Hot muggy weather and local thunderstorms in the area of the Wash ended the month.

June. The dry conditions of last month completely changed with the calendar as it was the wettest June in Norfolk since 1964. Many scattered places had over 100 mm (about 4"). On the last day of the month during a thunderstorm Besthorpe recorded 49 mm (1.93"). Mean temperature, 14°C (57°F) was equal to the average. Despite a very warm start with shade temperatures up to 26.5°C (almost 80°F) the second half failed miserably. The mean temperature was under 12°C (53½°F) compared with 15°C (59°F) for the first 20 days. Even the sun did not shine quite as much as normal (196.7 hours). Never theless there were no sunless days but only 5 with double figures in "Flaming" June.

July. Sunshine amounted to 158 hours which is 86% of average and there were 4 days with none at all. but in the second half of the month there were 5 days each with 13 hours or more. The mean temperature was almost 1½°C (2½°F) below normal (15.8°C or 60½°F). It was the coldest July in Norfolk since 1965 though 1978 ran it close. The maximum only touched 20°C (68°F) once, in the first three weeks, whereas in the last 10 days it was above 21¼°C (over 70°F) every day, reaching 27.2°C (81°F) on the 26th. Despite a few thunderstorms at the end of the month, there were no spectacular rainfalls. In central Norfolk there were totals of about average amounts, 60—70 mm (2.4"—2.8"), with less on the coast.

August. By contrast, very heavy thundery rain fell on the 7th of the month in the North of the county; several places around Walsingham recording over 75 mm (3") and two or three over 100 mm (4"). But south of Norwich had only 15—20 mm (6"— 8"). In central Norfolk rain, other than light drizzles, fell on 7 days in the month. The mean temperature, 16.3°C (60½°F), 3°C above normal, and the first time since April. The highest temperature was 26.4°C (nearly 80°F). There were 19 days above 21°C (70°F), i.e. a "summer day" and about as many as in July. Despite this warmth a frost was recorded on the 24th, but only -½°C on the ground. Sunshine hours amounted to just under 142, about 75% of normal. There were only 2 sunless days and only 4 with double figures.

September. The mean temperature was almost 1½°C (2½°F) above the average and nearly up to that experienced in August. A maximum of 25.1°C (77°F7 was measured on the 3rd and 21°C (70°F) or more was reached on 9 occasions. Sunshine hours amounted to 150 which is one hour more than

normal and there was only one day with none at all. It was a relatively dry month, especially up to the 19th apart from a thunderstorm on the 5th. Another one (on the 19th) was followed by 4 wet days and a dry final week. No monthly totals in the country exceeded 50 mm (2") and less than half this in areas near the Wash.

October. Unlike September, the October mean temperature of 9.0°C (48°F) was nearly 2°C (ver 3°F) below normal. There were 11 ground frosts, double the average. These were mostly in the middle of the month though the coldest night on the ground was at the very end with -5°C (23°F). However, sunshine was 27% above normal, with a total of nearly 128 hours but not as much as Oct. 1971 or 1977. Nevertheless, rainfall was the highest so far this year in much of Norfolk. As in January, amounts were highest near the coast and lowest in the West. Mostly, totals were about 50% above average.

November. Rainfall was 10% or more lower than usual and again North Norfolk was the wettest part. Walsingham and district had already exceeded their year's average. There was something to measure on 22 days but no heavy daily amounts. Sunshine was down by over 20% to give a total at Morley of under 54 hours. Nearly half of this was in the last six days but, in all, there were 12 days days with none to record. The mean temperature was 6.3°C (43.3°F) only 13°C below average. It was a month of contrasts with 6 days having maxima in excess of 13°C (55½°F) in the middle, but almost as many down to 4 and 5°C (39 to 41°F) at the beginning and the end. The first 10—12 days were reckoned to be the coldest for August ever recorded.

December. Snow fell on 5 days but it was not cold enough to remain long and never reached a depth of more than an inch or so. Total precipitation was slightly above normal but no heavy falls and not even two consecutive dry days. The month began with a cold spell but it became quite warm later on. Sunshine was slightly on the high side with just over 43 hours. Over a third of this total was recorded on four consecutive days beginning with Christmas Day. However there were 13 occasions when it never shone at all.

The year. For the year, as a whole, the mean temperature was 9.2°C (48½°F) and .2°C below the average. A disappointing summer tended to make one think the year was even colder than it was. But May, June and July had all been colder than usual, collectively by 2½°C (4½°F). There were only 8 days with temperatures above 25°C (77°F), i.e. a "Hot Summer Day".

Rainfall was very variable and reached maxima, in the Walsingham area, from 884 mm (34.8") to 531 mm (20.9") at Burgh Castle in the opposite corner of the county. Generally speaking, yearly totals were about 5% above normal. May was by far the driest month while both June and October were the wettest.

The Seasons. As in other years winter consists of Dec., Jan. and Feb. (Spring—March, April, May 'et seq.'). Thus December here is Dec. *1979* and leads to one or two anomalies when comparing the year as a whole with that of the calendar year in the main tables later on. Rainfall for Dec. '79 was nearly double that for Dec. '80 and both temperatures and sunshine were higher.

1980 Weather by Seasons

	MEAN TEMPERATURE		SUNSHINE HOURS		1980 RAINFALL		AVERAGE RAINFALL	
	1980 °C	AVERAGE °C	1980 HRS	AVERAGE HRS	MM	INCHES	MM	INCHES
WINTER								
Dec. 79	5.7	4.8	66.0	43.3	117.6	4.63	61.8	2.43
Jan.	2.0	3.6	71.3	41.9	45.0	1.77	53.6	2.11
Feb.	5.3	3.6	49.9	61.2	63.0	2.48	46.6	1.83
Overall	4.3	4.0	187.2	146.4	225.6	8.88	162.0	6.37
SPRING								
March	4.9	5.3	84.0	108.0	59.6	2.34	42.6	1.68
April	7.9	7.4	173.2	143.0	28.5	1.12	47.5	1.87
May	10.2	11.2	261.4	189.6	8.9	.35	45.2	1.78
Overall	7.7	8.0	518.6	440.6	97.0	3.81	135.3	5.33
SUMMER								
June	14.0	14.0	193.7	196.7	80.4	3.17	43.2	1.70
July	14.4	15.8	158.3	183.0	59.3	2.33	58.2	2.29
Aug.	16.3	15.9	141.8	180.6	35.9	1.41	54.9	2.16
Overall	14.9	15.2	493.8	560.3	175.6	6.91	156.3	6.15
AUTUMN								
Sept.	15.1	13.7	150.0	149.1	49.8	1.96	51.6	2.03
Oct.	9.0	10.7	127.8	100.8	80.9	3.19	54.5	2.14
Nov.	6.3	6.6	53.8	67.5	64.4	2.54	75.8	2.98
Overall	10.1	10.3	331.6	317.4	195.1	7.68	181.9	7.15
Year	9.2	9.4	1531.2	1464.7	693.3	27.30	635.5	25.02
Deviation	-.2		+4½%		+9%			

1980 Weather

	MEAN TEMPERATURE 3C 1980	MEAN TEMPERATURE °C Avg	NO. OF AIR AND GROUND FROSTS 1980	NO. OF AIR AND GROUND FROSTS Avg	SUNSHINE HOURS 1980	SUNSHINE HOURS Avg.
Jan.	2.0	3.6	15/26	10.4/17.6	71.3	41.9
Feb.	5.3	3.6	5/12	10.0/18.1	49.9	61.2
March	4.8	5.3	8/13	6.7/16.9	84.0	134.7
April	7.9	7.4	2/14	3.1/11.8	173.2	143.0
May	10.2	11.2	1/8	.5/4.5	261.4	189.6
June	13.9	14.0	—	.1/1.0	193.7	196.0
July	14.4	15.8	—	0/.2	158.3	183.0
Aug.	16.3	15.9	0/1	0/.1	141.8	179.2
Sept.	15.1	13.7	—	.1/.9	150.0	149.1
Oct.	9.0	10.7	2/11	.3/5.8	127.8	94.8
Nov.	6.3	6.6	4/15	5.6/12.1	53.8	67.1
Dec.	4.9	4.8	5/17	9.1/17.3	45.0	43.3
Year	9.2	9.4	42/117	45.8/106.2	1510.2	1482.9

	RAINFALL 1980	RAINFALL Avg.	DAYS WITH HAIL/SNOW 1980	DAYS WITH HAIL/SNOW Avg.	DAYS WITH THUNDER 1980	DAYS WITH THUNDER Avg.
Jan.	45.0	53.6	0/9	.5/3.8	—	.1
Feb.	63.0	46.6	0/1	.7/4.0	—	.3
March	59.6	42.6	—	.8/3.3	—	.5
April	28.5	47.5	1/0	1.5/1.6	—	1.3
May	8.9	45.2	—	.3/.1	—	2.6
June	80.4	43.2	—	.5/.1	7	2.4
July	59.3	58.2	—	—	2	2.4
Aug.	35.9	54.9	—	—	1	2.4
Sept.	49.8	51.6	—	.1/0	2	1.9
Oct.	80.9	54.5	1/0	.4/0	1	.7
Nov.	64.4	75.8	2/3	1.1/2.1	—	.5
Dec.	66.2	61.8	3/4	.7/2.9	—	.2
Year	641.9	636.0	7/17	6.6/17.9	13	15.3

NOTE: Omissions and mistakes have occurred in previous year's columns of Hail/Snow average figures.

NOTES TO CONTRIBUTORS

1. All manuscripts submitted for publication should be sent to Dr. E. A. Ellis, Wheatfen Broad, Surlingham, Norwich.

2. Manuscripts should be typed double spaced on one side of the paper. Latin names of genera and species should be underlined. Dates should be in the form 1 January 1972. Text figures should be referred to as Fig. 1, etc.

3. All Latin names should be followed by the authority when the name is first mentioned in the text or table.

4. References should be in alphabetical order at the end of the paper, in the form of:

Bloomfield, E. N., 1905. Fauna and flora of Norfolk.
Trans. Norfolk & Nor. Nat. Soc., 8. 117-37.

5. Tables should be set on separate sheets and numbered in arabic numerals.

6. Drawings should be in jet-black indian ink. Shading should be in lines or dots but not in half-tone washes.

7. Page-proofs only will be sent. They should be returned with the least possible delay, and the minimum of essential correction should be made.

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Norfolk Bird Report - 1980

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Norfolk Mammal Report - 1980

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NORFOLK BIRD REPORT 1980

Editorial

The Council of the Norfolk Naturalists Trust, in co-operation with the Norfolk & Norwich Naturalists Society, is pleased to present the annual report on the birds of Norfolk.

Review of the Year: The beginning of January found three Cranes remaining in the east of the County as well as a Richard's Pipit which stayed at Cley until the middle of the month. Two Ferruginous Ducks also appeared at Ranworth Broad at this time. The early months of the year produced some interesting records of seabirds with large numbers of Red-throated Divers, two Arctic Skuas and a Great Skua in January and two Pomarine Skuas in March. More unusual was a noticeable and unprecedented spring movement of Arctic and Great Skuas on 20th April during gale conditions.

The early spring produced few surprises apart from a Richard's Pipit which appeared at Winterton at the end of March, staying for over a fortnight, a Tawny Pipit at Weybourne for three days, and a Purple Heron at Heacham for two days, both in mid-April. The Cranes departed 5th April and were seen over Sheringham later in the day; amazingly these birds returned to their original location sixteen days later.

May to many Norfolk and visiting birdwatchers is undoubtedly one, if not the most, exciting month of the year and 1980 certainly exceeded many observers' expectations having regard to the large number of rare birds seen in May the previous year. Six Spoonbills appeared at How Hill early in the month and on the 15th a large movement of Black Terns took place. Unfortunately these birds passed through very quickly, but the easterly winds at the time undoubtedly resulted in the appearance of Bluethroats at Cley and Winterton and also an Ortolan Bunting at Cley. Possibly, however, May will be remembered for its waders with two Red-necked Phalaropes and a virtual avalanche of Temminck's Stints, especially at Hickling. This locality also produced the star of the month, a magnificent Black-winged Stilt which was seen by many observers. Nearby Breydon was not to be outdone and its specialist rarity, a Broad-billed Sandpiper, appeared at the end of the month as well as a Ring-necked Duck. The only rarity on the north coast was a singing Serin, present for two days at Cromer before flying off westwards.

June often produces a number of rarities in the county but in 1980 these occurred only on the first two days and again in East Norfolk, with a Red-throated Pipit at Breydon and a Caspian Tern at Hickling the following day.

Norfolk has always been an important county in a national context with regard to certain breeding birds and the year saw a noticeable increase in breeding Avocets and Savi's Warblers, together with a reversal of the previous downward trend of Woodlarks in the Brecks. Unfortunately the number of Red-backed Shrikes continued to decline and it seems likely that this species will cease to breed in East Anglia in the forseeable future for reasons not fully understood. Also on the credit side, however, a small number of 'nocturnal' birdwatchers have revealed for the first time the true picture of breeding Long-eared Owls in the county. If such a survey were conducted nationwide it could well produce a totally different situation to that

previously thought to exist, as in Norfolk where this species was believed to be only a rare breeding bird. May and June also found a number of singing Firecrests on territory but no positive proof of breeding was obtained. A sub-adult Mediterranean Gull was present during this period at Snettisham; hopefully both these species may be added to the list of the county's breeding birds at some time in the future.

July is normally one of the least interesting months in the ornithological calendar apart from the return of waders commencing southward migration. 1980, however, saw the arrival on the same day of a Gull-billed Tern at Titchwell and a Sabine's Gull at Sheringham: both these birds stayed many days and gave a great deal of pleasure to many birdwatchers, especially as they both allowed close views.

The beginning of August saw the arrival of two White-rumped Sandpipers at Cley. Towards the end of the month again at Cley a Caspian Tern (the second of the year) appeared before a hideful of observers. This period also produced the largest skua and shearwater movements of the year but despite a scattering of coastal Wrynecks, Barred and Icterine Warblers no large falls of continental drift migrants occurred. One exciting find early in September was a Sardinian Warbler at Weybourne; this national rarity attracted many visitors during its prolonged stay but also caused a considerable amount of frustration due to its very elusive behaviour.

In recent years October have proved more rewarding than September in terms of passerine migration and the year saw some spectacular 'falls' of thrushes in association with such attractive species as Yellow-browed Warblers and Red-breasted Flycatchers. Rarities during the month included both White-rumped and Buff-breasted Sandpipers as well as a White-winged Black Tern which stayed for a fortnight in the Titchwell/Holme area. A fortunate bird-ringer found a Pallas' Warbler in his net at Waxham on the last day of the month which was joined by a second individual two days later. These two birds were also present with three Firecrests and all gave very close views, giving to many the ornithological highlight of the year. Firecrests also appeared at other coastal localities followed by the arrival, somewhat amazingly, of three very late Yellow-browed Warblers at Holkham.

November again produced the now annual build-up of Slavonian Grebes in Holkham Bay as well as some spectacular movements of Little Gulls, especially on the north-east and east coasts. The middle of the month saw the only addition to the county list, a Citrine Wagtail, not being found as would have been expected somewhere on the coast but in Welney Wildfowl Trust reserve on the Ouse Washes! By the end of 1980 374 full species had been recorded in Norfolk.

Norfolk Breeding Birds Survey: As most readers will be aware a breeding birds survey is currently being undertaken in the county on a tetrad basis (2 Km squares) under the auspices of the Norfolk & Norwich Naturalists Society. Whilst this survey is being organised by Mr. Barrie Harding any records of important breeding birds will be forwarded for possible publication in the annual bird report, unless otherwise specifically requested by the observer concerned. It must be emphasised, however, that no localities of unusual or rare breeding birds will be published and any details will only be made known to the Editor. As it is vital that such breeding birds are disturbed as little as possible, and to respect the degree of confidentiality usually requested in such instances, no other person connected with the Norfolk Bird Report (i.e. County Recorders, Editorial Assistants or members of the County Records Committee) or other members of the Breeding Birds Survey Committee will be informed of any breeding records referred to above.

Recording: Records for the 1981 Report should be sent *by the end of January* to Michael J. Seago, 33 Acacia Road, Thorpe St. Andrew, Norwich NR7 0PP. Contributors are requested to submit notes in the order followed in Dr. K. H. Voous' *List of Recent Holarctic Bird Species* (1977). In order to minimise the work involved, records will not normally be acknowledged. The names of all contributors will be included in the report.

In last year's Report it was requested that any records of rare birds considered by British Birds Rarities Committee should be submitted with full details as soon as possible after observation and not left until the end of the year. Unfortunately in several instances this has not taken place and regretfully this year there are more outstanding decisions on rare birds than has ever previously occurred. Special record forms are available for submission of rare birds either from the secretary of the Rarities Committee as published in *British Birds,* or from the Editor or from G. E. Dunmore (49 The Avenues, Norwich).

The County Records Committee (B. Bland, G. E. Dunmore, D. J. Holman, S. C. Joyner and J. Kemp) considered an ever growing number of descriptions of semi-rarities seen in the county. The majority of submitted records were accepted by the Committee and only in a few cases was it considered a genuine mistake in identification had been made. In other instances it was felt as the species was so rare in the county (e.g. Cirl Bunting) that the submitted details were not totally sufficient to establish beyond all doubt the correct identification. As in previous years the Committee had particular problems with flight identification of Great Northern and especially Black-throated Divers. Unless close views are obtained or birds are seen in flight with other species of diver the Committee would suggest that normally it is unwise to assign divers in such instances to one particular species.

When the Committee was established in 1975 it was requested that descriptions be submitted for semi-rarities unless the bird or birds were seen by three or more observers (in which case the names of other observers where known should be stated). This request is still very much applicable especially as it has become necessary with the ever growing number of bird-watchers, for an increasing number of time-consuming 'follow up' letters to be written requesting descriptions.

The following is the current list of species and sub-species considered by the local Records Committee: Black-throated and Great Northern Divers; Red-necked, Slavonian and Black-necked Grebes; Great, Sooty and Balearic Shearwaters; Storm and Leach's Petrels; Ruddy Shelduck, Red-crested Pochard, Ferruginous Duck, Honey Buzzard, Red Kite, Montagu's Harrier, Goshawk, Buzzard and Rough-legged Buzzard; Peregrine, Spotted Crake, Corncrake, Kentish Plover, Dotterel, Temminck's Stint, Red-necked and Grey Phalaropes; Pomarine and Long-tailed Skuas; Mediterranean, Sabine's and Iceland Gulls; Roseate Tern, Black Guillemot, Little Auk, Hoopoe, Scandinavian Rock and Water Pipits; all continental races of *flava* Wagtail excluding Blue-headed, Bluethroat; Icterine, Barred and Yellow-browed Warblers; Red-breasted Flycatcher, Northern Long-tailed Tit, Northern Tree Creeper, Golden Oriole, Raven and Ortolan Bunting.

Bird Ringing Report

ONCE more an interesting and varied selection of recoveries was reported in 1980. No less than four species: Merlin, Stone Curlew, Arctic Tern and Waxwing appear in the ringing section for the first time. Details of the first Marsh Harriers and Little Ringed Plover to be ringed outside Norfolk and found within the county are also included. Although many large birds are known to live for a considerable time, longevity is not a feature of passerines. It is therefore pleasing to note an eleven-year old Chaffinch and a ten-year old Blackbird and Dunnock. A Swift controlled in Norwich had been ringed in the same area twelve years previously.

Apart from the Wash Wader Ringing Group, the dozen or so ringers in the county who concentrate on passerines and near-passerines, ringed a total of 14,500 birds during the year. Included in this total were single Pallas's and Yellow-browed Warblers, 3 Cetti's Warblers, 6 Firecrests, 2 Red-breasted Flycatchers and single Blue-headed Wagtail and Red-backed Shrike.

As last year, I am indebted to those ringers who have sent me details of their recoveries and controls, in particular Dr Nicholas Branson, secretary of the Wash Wader Ringing Group. Once again, he has allowed me to use material published in the WWRG Report, as well as interpreting the more interesting wader movements. Copies of the 1979-80 Wash Wader Ringing Group Report may be obtained from Dr N. J. B. A. Branson, Trinity College, Cambridge, price £2 post free.

Moss Taylor

Fulmar

There have been only two previous foreign recoveries of Norfolk-ringed Fulmars, while the recovery from Norway is only the second foreign-ringed one to be found here.

Sheringham (adult) 26.6.76	De Haan Wenduine, West-Vlaanderen, Belgium (sick on beach) 8.7.80
Karmoy, Rogaland, Norway (pullus) 29.7.78	Cromer (dead) 10.10.78

Manx Shearwater

The only other recovery of a Manx Shearwater in Norfolk was from the Welsh breeding colony on Skokholm.

Rhum, Inverness (pullus) 13.9.78	Heacham (dead) 8.10.78

Heron

An unfortunate victim of discarded fishing line.

Wickhampton (pullus) 30.5.74	near Bath Avon 6.9.80

Teal

De Koog, Texel, Holland 18.9.78	Swaffham (shot) 1.1.80

Mute Swan

The sedentary nature of our Mute Swans is shown by the fact that this was only the fourth recovery of one ringed outside Norfolk.

Bedford, Bedfordshire 11.7.71	Stowbridge GP, Downham Mkt. 12.4.80

Marsh Harrier

There have been no previous recoveries of birds ringed outside the county. Perhaps the recent recolonization of Norfolk is a result of expansion from Suffolk.

Walberswick, Suffolk (pullus) 18.7.78 Wolferton Wood, King's Lynn (dead under wires) 10.11.78

Walberswick, Suffolk (pullus) 30.6.77 South Walsham (decomposed on fence) 23.6.79

Merlin

The first recovery of this species affecting Norfolk.

Northumberland (pullus) 17.6.71 Feltwell, Downham Mkt. 15.10.78

Oystercatcher

The main breeding area for Oystercatchers from the Wash has been shown by ringing to be the west coast of Norway. This is the first recovery in Finland from the Wash.

Heacham 5.7.69 Kunlinge, Aland, Finland 15.7.79

Lapwing

The first recovery involving a movement between Norfolk and Finland.

Tyrvanto, Hame, Finland (pullus) 9.6.68 Titchwell 13.1.78

Stone Curlew

The first recovery of a Norfolk-ringed Stone Curlew.

near Mundford (pullus) 5.7.77 Guissona, Lerida, Spain 25.10.78

Ringed Plover

The recovery given, resulted from a report of a Ringed Plover marked with a small yellow 'flag' on its leg. Observers seeing any wader so marked, colour-ringed or dye-marked are asked to send full details to Dr M. Pienkowski, Dept. of Zoology, University of Durham, South Road, Durham, DH1 3LE.

Heacham 31.8.80 Sheringham 9.12.80

Little Ringed Plover

The first recovery from outside the county.

Wraysbury, Berkshire (pullus) 26.5.80 Wisbech SF (control) 29.8.80

Grey Plover

Although Siberian-breeding populations are known to occur at the Wash, this is only the second British-ringed Grey Plover recovery in the USSR and much farther east than the first.

Heacham 4.12.71 Yar Sale Yamal, USSR (66 49'N 70 50'E) 27.8.78

Knot

Note rapid movement of the second bird.

Wolferton 10.9.79 Banc d'Arguin, Mauritania 19.1.80

Revtangen, Rogaland, Norway 9.9.79 Wolferton (control) 10.9.79

Sanderling

The first British-ringed Sanderling to be recovered in Tunisia.

Snettisham 28.7.76 Tunis, Tunisia 27.8.78

Ruff

Wisbech SF 14.8.75 Carentan, Manche, France 3.1.79

Bar-tailed Godwit

Previously there have been only two breeding-season recoveries of Bar-tailed Godwits from Britain, both on the River Yenisei and only 200 km from the Arctic Ocean.

North Wootton 23.7.78 Lar'yat, Khanty-Mans, USSR 25.5.79

Wolferton 24.6.78 Mezen, Arkhangelsk, USSR 18.5.80

Redshank

Only the second Wash-ringed Redshank recovered in Morocco.

Wolferton 16.9.78	Safi, Morocco 1.1.80

Black-headed Gull

Recoveries included winter movements between Norfolk and Holland (5), Norway, Denmark (7), Sweden (2), Finland (4), Poland, Estonia, Latvia and USSR. Given in full is only the fourth recovery in Norway and two recoveries where the ring number was read in the field, both of which indicated different wintering areas from the time of ringing.

Salthouse (pullus) 3.7.79	Friskney, Lincs. 26.5.80
Norwich 31.12.70	Copenhagen, Denmark (field record) 23.2.80
Norwich 18.12.76	Grootegast, Groningen, Holland (field record) 24.1.80 - 15.2.80
Norwich 12.2.78	Hut, Oslo, Norway 24.6.80
Holt 19.2.78	Lyuban, Belorussiya, USSR 10.5.78

Common Gull

Sheringham 28.1.79	Watton, Humberside 7.11.80

Arctic Tern

The first recovery of this species affecting Norfolk.

Bergo, Vaasau Laani, Finland (pullus) 15.7.67	Winterton (found exhausted, released later) 4.5.80

Swift

The fidelity of Swifts to their breeding areas is well illustrated by this bird, which was at least thirteen years old when controlled, although still three years short of the British longevity record for the species.

Earlham (adult) 20.7.68	Earlham (controlled) 11.7.80

Sand Martin

Earlham (roost) 19.7.76	Ryarsh, Kent (control) 4.5.80
Hillington (colony) 6.7.79	Blyth, Nottingham (control at colony) 27.7.80
Stanton Harcourt GP, Oxon (colony) 14.7.79	Tottenhill GP, King's Lynn (control) 13.7.80
St Osyth, Essex 23.7.80	Weybourne (control) 3.8.80

Waxwing

The first British-ringed Waxwing to be recovered in USSR.

Heacham 3.11.74	near Kirs, Kirov, USSR 27.10.77

Dunnock

Two interesting recoveries are given. The first an exceptionally old Dunnock, found freshly dead in at least its tenth year and the second, presumably a locally bred bird, as it was in juvenile plumage when ringed, moving 177 Km south to Kent. Normally regarded as a sedentary species.

Thorpe End 12.12.71	Norwich 15.2.80
Gillingham (juvenile) 23.8.80	Dungeness, Kent (control) 30.9.80

Robin

Holme 30.9.79	Balsham, Cambridgeshire 19.1.80
Holme 1.10.80	Burgerveen, Holland 23.10.80

Blackbird

Movements were recorded between Norfolk and Holland, Norway, Sweden (2) and Finland. Full details given include a ten year old bird and a recovery in Wales, suggesting onward movement of a continental migrant.

Little Plumstead (pullus) 20.5.71	Blofield Heath 25.8.80
Gillingham 26.10.80	Bardsey Island, Gwynedd, Wales (control) 10.11.80
Holme 27.10 80	Svortevik, Norway, 6.1.80
Lagskar, Aland, Finland 18.3.77	Downham Mkt. (control) 27.1.80

Fieldfare

Sprowston 24.1.79	Raalte, Overijssel, Holland 24.5.80

Song Thrush

The bird recovered in the USSR was ringed at the same locality and on the same date as one recovered in Estonia in 1979 (see *NBR* 1979 p.107). Amazingly, the only other British-ringed Song Thrush to be found in either the Baltic States or Russia was also ringed in Norfolk (see *NBR* 1978 p.12)

Holme 1.10.79	Corticada, Portugal 10.1.80
Waxham 7.10.78	Volgorechensk, Kostroma, USSR 15.12.80

Sedge Warbler

Holme 26.8.80	Maidstone, Kent (control) 13.9.80

Reed Warbler

Holme 18.8.74	Old Hunstanton (retrap) 17.7.80
Earlham 15.8.79	Guernsey, Channel Isles (control) 8.8.80
Titchwell 22.9.80	Coimbra, Beira Litoral, Portugal Autumn '80

Lesser Whitethroat

Sheringham 2.9.80	Halesworth, Suffolk (dead) 20.10.80

Blackcap

Sheringham 10.8.79	Wanstead, London 8.10.79

Garden Warbler

Holme 12.8.75	Gunnislake, Cornwall 22.5.80

Chiffchaff

Presumably an example of reorientation.

Happisburgh 12.5.80	Trischen, Germany (control) 21.5.80

Great Tit

Sheringham 15.7.80	Hunstanton (control) 22.11.80
Sutton Coldfield, Staffs (1st winter) 10.12.79	Hillington (control at nest-box) 17.5.80

Blue Tit

Happisburgh 29.9.80	Woodbridge, Suffolk (control) 19.10.80
Gillingham (pullus) 25.5.80	Waxham (control) 20.10.80

Starling

Recoveries followed the usual pattern with movements between Norfolk and the Continent, Scandinavia and Eastern Europe.

Chaffinch

The bird reported in *NBR* 1979 p.108, was retrapped again in 1980, in at least its eleventh year.

Holme 29.4.70	Old Hunstanton (retrap) 4.8.80

Brambling	
Wilburton, Cambs. 16.1.80	Methwold Fen (control) 23.2.80
Greenfinch	
Gillingham 22.7.79	Coombs Dale, Derbyshire 20.3.80
Linnet	
Happisburgh 2.5.78	Balen, Antwerpen, Belgium (trapped and released!) 26.11.78
Redpoll	
Titchwell 9.7.79	Colchester, Essex (control) 14.1.80
Reed Bunting	
Titchwell 3.11.78	Methwold Fen (control) 16.3.80

Classified Notes

These notes are based on *Birds of Norfolk* (revised edition 1977) where fuller details regarding status, distribution, migration and ringing recoveries may be found. Records for Wisbech Sewage Farm (part of which is on the Lincolnshire side of the county boundary) have been selected from the files of Cambridge Bird Club. Fuller details of Fens records may be found in the Cambridge Bird Club Report for 1980.

The order used is that of K. H. Voous (1977) List of Recent Holarctic Bird Species. Observations refer to 1980, unless otherwise stated. To save space, all but the most essential initials have been omitted. Records are of single birds unless otherwise stated.

Red-throated Diver: N/E coasts: Unusually large numbers Jan.-March. At Cley 230 east in 30 minutes Jan. 5th. At Sheringham peaks of 218 Jan. 2nd, 166 on 13th, 200 Feb. 2nd, 100 on 9th, 280 on March 15th, 110 on 19th, 120 on 20th — all to the east. Winterton, 130 north March 16th. Only three inland records: University Broad Norwich Jan. 20th, Martham Broad Feb. 19th, and Ant Mouth Oct. 31st.

Black-throated Diver: North: Cley March 29th, Oct. 11th and 25th, Nov. 14th (2), Sheringham Sept. 13th, Nov. 9th (2), Paston Feb. 1st, March 6th (2) and Mundesley Feb. 9th. East: Winterton Jan. 20th (3), May 10th, Oct. 18th and Dec. 23rd, Caister April 21st.

Great Northern Diver: Coastal records as follows: Snettisham Jan. 1st-10th, Hunstanton Jan. 1st, 6th and 20th, Nov. 24th and 29th, 2 Dec. 27th, Scolt Head full summer plumage June 3rd, Holme Dec. 22nd, Brancaster Sept. 29th, Dec. 13th, Titchwell Nov. 15th, 2 Nov. 24th, Dec. 30th, Holkham Nov. 4th, Wells Nov. 2nd, Cley Jan. 5th and 12th, Oct. 18th, Salthouse Jan. 27th, Sheringham March 15th and 19th, Cromer 2 Nov. 13th, Paston Feb. 14th and Nov. 10th, Winterton March 16th, Sept. 21st and Gorleston 2 Nov. 29th/30th.

Little Grebe: Breeding records in Brecks at Fowl Mere, Ring Mere, West Tofts Mere, Stanford Water, West Mere, Tottington West Mere, Brandon-Santon Downham, Gooderstone and Cockley Cley; in Broads area at Breydon (6 pairs), Strumpshaw and Muckfleet area; and in North at Templewood and Titchwell (6 pairs). Wash: Winter peaks of 66 at Snettisham Jan. and 79 in Nov.

Great Crested Grebe: Broads: Build-up at Filby noted at end of 1979 continued with 45 Jan. 1st; also 32 Nov. 7th. Wash: Peak of 67 off Snettisham July 27th.

Red-necked Grebe: N/E coasts: 36 records up to April 5th and from Sept. 4th. Mostly singles but 3 off Mundesley Feb. 9th and 4 off Titchwell Oct. 28th.

Further reading: 'Influxes into Britain and Ireland of Red-necked Grebes and other waterbirds during winter 1978/9' (*British Birds* 74, 55-81).

Slavonian Grebe: North: Hunstanton Jan. 27th, Feb. 3rd, 5th and 16th, Oct. 22nd, Holme Feb. 9th and 6 March 7th, Titchwell 2 March 30th, May 18th, Oct. 18th, 2 on 26th, 27th and Dec. 13th; Brancaster 2 Dec. 13th, 8 on 14th, Holkham/Wells up to 10 Oct. 14th to Nov. 4th., Cley Jan. 20th and Oct. 25th, Salthouse Jan. 22nd (dead), Weybourne Nov. 5th, Sheringham 6 March 1st, Paston Nov. 1st and 8th, dead on 10th. East: Waxham Nov. 9th.

Black-necked Grebe: N/E coasts: Wells Jan. 5th, Scolt Head 3 April 1st (one in breeding plumage), Winterton Aug. 23rd. Broads: Ranworth Sept. 7th; Breydon 2 April 9th and one on 20th (breeding plumage).

Fulmar: North: Total of 41 young between Weybourne and Cromer, as follows: Weybourne to Sheringham 29, Sheringham to West Runton 1, West to East Runton 2, East Runton to Cromer 9. 19 returned to breeding cliffs at Sheringham Nov. 8th. Wash: Hunstanton 27 young in Aug; 50 pairs again by end of year. Exceptional movement of 1,600 to east off Sheringham March 19th.

East: Happisburgh, one young raised. Inland (West), Hillington GP June 27th. Blue phase birds at Sheringham March 15th and 19th, Cromer April 23rd and Paston Aug. 31st.

Sooty Shearwater: North: Holme Sept. 28th, Cley Aug. 31st, Sheringham Aug. 31st, Paston 8 Aug. 23rd, 2 on 31st and 3 Oct. 11th.

East: Winterton 26 north in 4 hours Aug. 23rd, 3 on 31st and one Oct. 11th.

Manx Shearwater: N/E coasts: Impressive movement Aug. 31st when 23 off Winterton, 53 Paston, 31 Sheringham and 3 Titchwell. Other movements included 37 Sheringham July 20th, 17 on 21st, 13 Cley July 1st, 17 Holme July 2nd. Wash: Snettisham 10 Sept. 13th with 6 on 14th/15th; Terrington Marsh Sept. 15th.

A bird of the Balearic race Winterton Aug. 31st.

Storm Petrel: North: Holme 2 July 2nd; Sheringham Oct. 12th.

Leach's Petrel: North: Cley Oct. 12th, Weybourne 1-2 Oct. 11th, Paston Aug. 31st and Oct. 11th.

East: Bacton dead Oct. 18th.

Gannet: Peak movements: North: 550 east Sheringham March 19th with 500 east in two hours Oct. 16th; 450 east Paston Nov. 6th.

Cormorant: Fens: Welney peaks of 74 Jan. 23rd, 60 March 16th and 40 Nov. 20th.

Shag: N/E coasts/Wash: ones and twos in Jan. and from Sept. 13th. Broads: Hickling 2 on following dates: Jan. 2nd, April 4th and May 2nd.

Bittern: Broads: Seven regular boomers compared with 9 in 1979. North: 3 boomers and 4 known nests. An unfortunate casualty at Cley where one telegraphed Aug. 22nd.

Further reading: 'Wintering Bitterns in Britain' (*British Birds* 74, 1-10) and 'Status of Bitterns in Europe since 1976' (*British Birds* 74, 10-16).

Grey Heron: The following heronries were counted: *Borders of the Wash:* Snettisham 16. *Brecks:* Tottington 2, Didlington 4, Sturston Carr 3, Shadwell 3. *Fens:* Islington 116 and Hilgay 43. *North:* North Elmham 3 and Cley 7. *Broads:* Hickling (Sounds Plantation) 17, and Fritton (Waveney Forest) 3. Narford and Denver not occupied.

Unusual sight of 19 in V formation in from sea and calling at Weybourne Sept. 20th; also similar party arriving from east at Holme same date.

Purple Heron: North: Cley Aug. 26th (MLP JCT). Wash: Heacham April 13th-14th (CAEK RCM).

East: Winterton May 2nd (RM). Additional 1979 record: Breydon Aug. 13th (CDRH RDH).

Spoonbill: Fewer records than in recent years. North: Cley/Salthouse May 21st-27th. Fens: Welney March 28th to early May. Broads: Breydon April 17th, How Hill 6 May 5th and Cantley Sept. 1st.

Mute Swan: North: Felbrigg Lake, pair raised 3 cygnets two of which were of Polish all-white variety.

Bewick's Swan: Recorded to Feb. 28th and from Sept. 28th. As usual largest concentration in Fens (Ouse Washes) of 2,050 in Jan. with 2,120 mid-Feb. (up to 75% at Welney) and record count of 2,995 (including 440 juveniles) mid-Dec. South-east Norfolk total of 232 Feb. 4th (141 St. Benet's Level, 30 Muck Fleet, 33 Halvergate, 5 Heigham Holmes and 23 Potter Heigham). Additional counts (probably mostly same birds listed above) include 92 Halvergate Jan. 20th and 97 Filby Broad on 24th; 65 Heigham Holmes Jan. 13th and 60 Feb. 20th; 81 Halvergate, Tunstall and Clippesby Feb. 10th.

Brecks: Up to 5 Ring Mere and 18 Fowl Mere Nov.-Dec.

February easterly exodus: 47 Strumpshaw on 10th, 70 East Tuddenham on 17th,

100 on 18th and 50 on 28th when 30 Chedgrave. North coast westerly movements included 46 passing Holme, 20 Holkham and 21 Cley Oct. 26th; 26 Titchwell Oct. 27th and 11 Brancaster Dec. 6th.

Whooper Swan: Recorded up to March 16th and from Oct. 25th. Largest number in Fens at Welney where 106 mid-Jan. and 80 at end of year.

Broads: Heigham Holmes up to 46 in Jan., 38 in Feb. and 12 March 7th.

Bean Goose: East: Up to 155 in usual area till March 1st; first 70 returned Nov. 29th increasing to 168 by Dec. 16th. North: Holkham 5-9 Jan. 19th-Feb. 18th. Wash: Welney 18 Feb. 13th-March 13th.

Pink-footed Goose: Wash (Snettisham): 3,720 in Jan., 1,350 in Feb. and last 3 April 19th. First 3 returned Oct. 25th, 970 Nov. 12th, 1,250 by 29th and 1,600 by Dec. 20th. North: Holkham 60 Jan. 19th-Feb. 18th and 55 Dec. 8th; Scolt Head 90 Nov. 20th 1979 to Jan. 19th 1980 (first wintering record).

White-fronted Goose: Broads/Yare Valley/Hickling and Horsey up to 23 Jan. and Dec. North: Holkham 90 Jan. 8th, 154 Feb. 2nd and 145 on 17th. Last March 3rd with return from Nov. 29th (7) and 84 from Dec. 8th.

Barnacle Goose: East: Yare Valley Jan. 7th-Feb. 10th. Broads: Hickling 10 Jan. 4th-9th and Potter Heigham/Horsey 11 Jan. 1st-10th.

Brent Goose: Maximum numbers at regular localities: Cley 2,400, Burnham Norton 1,200, Wells/Holkham 3,000-4,000, Scolt Head 2,000, Holme 1,700 and Snettisham 1,380.

Unusual numbers moving west at Sheringham: 1,385 Oct. 12th and at Paston: 2,475 Oct. 11th and 1,752 on 12th.

Egyptian Goose: Recorded at 14 localities. Largest numbers in Holkham Park (100 Aug.) and Flitcham (68 Dec.)

Ruddy Shelduck: East: Winterton Oct. 18th and North: Wells Oct. 25th. These observations probably relate to waterfowl collection escapes, perhaps from Germany or Holland.

Shelduck: Most impressive assemblies on Wash. At Snettisham peaks of 4,650 in Feb. and 5,154 in Nov. Between King's Lynn Point and North Wootton saltings 2,268 Aug. 1st including over 1,000 in full wing moult. Breeding records away from coast include single pairs at Aldeby, Flitcham, Stanford Water, Thompson Water, West Tofts Mere and Wolterton Lake, 2 pairs each at Lyng Easthaugh and Hoveton Great Broad, 3 pairs at Gillingham and several pairs at Wissington BF and Gunton Park.

Mandarin: Broads: Hardley May 20th.

Wigeon: Fens (Ouse Washes, Welney) 18,000 in mid-Jan. and 17,000 in Dec. East: Buckenham 5,000 in Jan. North: Cley 4,000-5,000 Oct.

Gadwall: Largest counts: Brecks: Narford 60 Jan. 20th and Stanford Water 250 in Aug. West: Hillington Park 35 Dec. 3rd. North: Gunton Park 503 Oct. 20th and Wash: Snettisham 103 in Dec. Breeding population still increasing and 12 pairs bred Strumpshaw and 7 pairs bred Titchwell.

Pintail: Wash: Snettisham peak of 548 in March and 563 in Dec. Fens: Welney 500 Jan. East: Hardley 2 pairs April 12th-May 20th with one pair till 24th. North: Cley 280 in Nov. and 250 in Dec. Unusual numbers moving west off Paston Oct. 11th when total of 206 followed by 90 west off Scolt Head next day.

Garganey: Spring arrival from April 12th (Cley) and subsequently at Breydon, Cantley, Hickling, Hardley, Holkham, Salthouse, Sheringham, Titchwell, Tottenhill

Above: Four pairs of Arctic Terns attempted breeding in north Norfolk *(Photo: Dr. M. Hill).*

Below: This fearless Dotterel remained six days at Weybourne in June *(Photos: R. Tidman).*

Above: A Black-winged Stilt delighted Hickling bird-watchers in late May. The first county occurrence since 1968 when one briefly visited the same locality *(Photo: Dr. K. Carlson).*

Below: At least eight Sabine's Gulls were identified in 1980 including this individual which stayed two weeks at Sheringham.

(Photos: W. J. Low).

and Welney. Only breeding record from Hickling (3 young reared).

Shoveler: Brecks: Narford 100 Jan. 20th and Mickle Mere 36 March 23rd. Broads: Hoveton Great 250 in Aug./Sept.

Red-crested Pochard: Fens: Welney Feb. 14th to end of March. Central: Sparham Nov. 29th. Both suspected escapes from collections.

Pochard: Fens: Welney 4,700 in Feb. Wash: Snettisham 96 in Feb. and 85 in Dec. Brecks: Mickle Mere 50 in Nov. West: Tottenhill 48 in Feb. Broads/Brecks: Usual breeding records.

Ring-necked Duck: East: Breydon drake May 27th (AA *et al*). Additional 1979 record: drake Bayfield Lake Dec. 26th (RT).

Ferruginous Duck: Broads: Ranworth 2 Jan. 15th-17th (PRA ADB DB).

Tufted Duck: Winter counts include 200 Narford in Jan. and 157 Snettisham in Feb. Usual Brecks/Broads breeding records with 5 pairs nesting for first time in North at Titchwell.

Scaup: Largest number on Wash. At Snettisham 47 in Jan. and 89 in Dec. Usual mid-summer occurrences: drake Titchwell June 29th to July 14th, 5 Paston July 2nd and 6 drakes Breydon July 10th.

Eider: Recorded each month. Largest assemblies at main localities: Hunstanton 350, Snettisham 30 (including 14 roosting on beach July 15th), Titchwell 170 and Scolt Head 50.

Long-tailed Duck: Wash: Hunstanton/Holme monthly totals: Jan. 30, Feb. 18, March 11, April 2, Oct. 4, Nov. 5 and Dec. 26. Also one off Snettisham Oct. 12th-26th. North: Ones and twos (also groups of 4 and 7 and once 20) up to May 5th and from Aug. 31st. East: Gorleston 1-2 Nov. 3rd onwards. Horsey March 22nd. Winterton 3 Oct. 18th. Broads: Martham Jan. 13th-15th.

Common Scoter: N/E coasts: Highest estimates 60 Gorleston (Nov.), 150 Holme (March) and 300 Titchwell (May) where 400 (Oct.-Nov.) Inland: Wissington BF 3 April 26th.

Velvet Scoter: Wash/N/E coasts: Recorded each month. Apart from 30-35 off Heacham-Hunstanton Feb.-March no party exceeded 13.

Goldeneye: Maxima as follows: Wash: Snettisham 67 (March) and Hunstanton 47 (Jan.). North: Scolt Head 70 (1979-80 winter). Broads: Martham 15 (Nov.-Dec.), and Ormesby 14 (Feb.)

Smew: Records of 1-3 up to April 14th and from Nov. 28th at Hickling, Holme, Hunstanton, Martham, Morston, Paston, Snettisham, Titchwell and Welney.

Red-breasted Merganser: Wash/North coast peaks including Brancaster 38 Nov., Hunstanton 50 March and 40 Feb.-April and Nov.; and Snettisham 54 Dec. East: Winterton 22 Oct. 12th.

Goosander: Winter records at eight localities (compared with almost 50 in 1979). Maximum 16 Gunton Park in March.

Ruddy Duck: East: Lound Dec. 30th (BAC).

Honey Buzzard: North: At least one present May 20th to Aug. 9th at one locality, but no proof of breeding. Additional records at Bacton Wood Aug. 9th and Paston on 18th.

Black Kite: North: Burnham Deepdale Aug. 24th (RF, GJH).

Red Kite: North: Cley March 15th (WB), 24th (JR WB), Blakeney March 24th (ACM), Burnham Overy March 16th (SCJ) and Holme May 2nd (HBO). Brecks: Bodney Dec. 31st (GJ). East: Waxham March 16th (JRW).

Marsh Harrier: Total of 11 pairs nested rearing a total of 24 young to flying stage. Numerous coastal records and at one site 10 roosting together in late Aug. and up to 4 there till Sept. 30th.

Hen Harrier: Again recorded at many localities. Majority of observations in coastal areas, but others ranged over heaths well inland. Latest dates April 16th (Hickling), 24th (Rockland and Roydon) and 26th (Cley); also May 5th (Happisburgh). First in autumn Sept. 7th (Holme) and 13th (Snettisham).

In opening months 3 roosts in North, one in NW and 3 in Broadland with a total of 44 birds including 17 males.

Montagu's Harrier: North: Titchwell May 17th-25th and Scolt Head June 5th. Brecks: Hilborough-Foulden May 2nd-16th. Broads: Rockland May 30th, Strumpshaw April 23rd, May 3rd and 8th, Hickling May 30th to June 11th and July 14th. No breeding records.

Goshawk: At least one pair bred in county. Wash: Wolferton Nov. 22nd. into Dec. East: Winterton April 13th, May 4th (with jesses) and 27th may relate to same bird.

Sparrowhawk: Recorded at over 90 sites, but only two breeding records. Interesting total of 27 south at Winterton April 12th-15th; also 10 to north on 27th.

Buzzard: North: Burnham Deepdale Feb. 17th, Scolt Head April 1st, Edgefield July 6th, Sheringham 4 March 31st, singly April 5th and on several dates in June. East Broads: Breydon May 8th, Hickling March 26th and April 13th, Ormesby March 26th, Winterton March 22nd, May 10th, 17th and 18th, Fritton 3 in Jan., 2 till mid-Feb. and one summered till mid-Aug. with one in Dec.

Rough-legged Buzzard: North: Wells Oct. 14th, Salthouse Heath Oct. 16th, Barrow Common Oct. 20th and Titchwell Oct. 21st, Holkham Nov. 1st, Weybourne Nov. 2nd. East: Filby April 14th, Waxham Oct. 22nd, Winterton April 11th, 13th, May 6th, 10th (2), 13th and Oct. 18th. Broads: Hickling April 2nd, 4th, Oct. 25th, 29th and Nov. 26th.

Osprey: Singles at Blakeney, Brancaster Staithe, Cley, Hickling, Holkham, Hunstanton, Lound, Lyng Easthaugh, Sculthorpe, Strumpshaw, Snettisham, Thompson Water, Titchwell and West Acre. Recorded April 3rd to Sept. 29th.

Merlin: Recorded from over 30 localities up to May 5th and from Sept. 30th. Mainly singles, but 3-4 Roydon Common in Jan.

Hobby: Singles at Breydon, Bacton, Cley, Holme, Horsey, King's Lynn, Santon Downham, Sheringham, Strumpshaw, Smallburgh and Winterton. Recorded May 4th-Oct. 3rd.

Peregrine: North: Sheringham March 19th, Cley Sept. 15th and Titchwell Jan. 20th. Brecks: Narford Jan. 6th. Wash: Hunstanton Jan. 12th, Snettisham 2 Jan. 22nd and one April 11th, Wolferton Jan. 13th. East: Wickhampton Jan. 30th.

Quail: North: Calling Cromer May 25th-27th and Northrepps June 19th. West: Calling Pentney June 4th-July 4th.

Golden Pheasant: Recorded at Croxton, East Wretham, Hockham, Lynford, Narford, Sandringham, St. Helen's Well, Swaffham Heath, Thetford and Thompson.

Water Rail: North: Interesting record of one in from sea Weybourne Nov. 1st and landing on beach.

Spotted Crake: North: Holme Sept. 22nd and Titchwell Sept. 22nd-27th. Broads: Hickling Oct. 19th, 29th-30th and Dec. 9th-24th.

Crane: The party of 3 present at the end of 1979 was joined by a fourth bird during March. 3 remained until April 5th when at 1050 hours all climbed to a height of 2,500

to 3,000 feet and appeared over Sheringham at mid-day before circling and heading west along the ridge. All 3 returned April 21st and 2 stayed from late April until end of year.

Additional 1979 records: Strumpshaw 2 March 18th and Salthouse Broad immature Sept. 17th (RMT).

Oystercatcher: Breeding pairs: East: Singles Hardley Flood, Hickling and Langley. Wash: Snettisham 14. North: Blakeney Point 175, Scolt Head 150/160 and Wells Lodge Farm 15.

At Snettisham winter peaks of 8,350 Feb. and 10,090 Nov.

Black-winged Stilt: Broads: Hickling May 19th-30th (many observers).

Avocet: North: Cley present March 4th to Oct. 30th and 20 pairs bred. First eggs hatched May 5th and last on June 26th. Fakenham Racecourse (Pudding Norton) March 17th — after heavy rain. Titchwell: May 10th, May 11th (3), 16th, 27th (2) and July 26th. Wash: Snettisham: June 10th. East: Breydon singles on several dates Jan. 1st-April 2nd with up to 6 April 12th-June 3rd and 9 May 16th and Winterton 8 south April 13th. Broads: Hickling March 26th, April 6th-18th, May 6th-12th, June 13th (8), June 14th (9), Aug. 2nd (3), Aug. 28th-31st and Nov. 6th; Strumpshaw July 28th. Fens: Pentney April 6th and Welney pair April 12th, 26th and possibly same pair with 3 flying young July 31st-Aug. 3rd.

Stone Curlew: Brecks: Recorded from March 26th at 30 sites. North: 2 pairs at one site.

Little Ringed Plover: Recorded March 26th (Cantley) to Nov. 2nd (Holme). 23 breeding pairs at 12 localities. Early autumn counts include 9 Cantley, 6 Holme and 10 King's Lynn Beet Factory.

Kentish Plover: North: Cley April 13th and May 5th. East: Breydon April 5th/6th and May 5th/6th. Broads: Hickling Aug. 2nd.

Dotterel: North: Weybourne June 7th-12th and Cley Aug. 2nd. West: Docking 6-7 May 13th-16th. East: Happisburgh 6 May 7th and 2 June 8th-10th.

Golden Plover: Largest gatherings: Holme 1,000 (Nov.) and Welney 2,000 (April).

Grey Plover: Wash: Snettisham peak of 1,400 April and 1,123 Aug. East: Breydon highest spring count 127 May 13th.

Knot: Wash: Snettisham 35,000 in Jan. and 25,000 in Aug., Nov. and Dec.

Sanderling: Wash: Snettisham peaks of 370 in May, 845 in July/Aug. and 190 in Nov. North: Titchwell 200 in May and 150 in June. Away from coast singles at Strumpshaw May 17th and at Hickling on 25th.

Little Stint: *Spring:* North: Cley March 22nd and 29th/30th, April 4th and 11th, May 10th (2), 14th (4), 16th (12), 18th (6), June 1st, 7th (3) and 12th (4). Holme May 14th (2). Inland: Lyng Easthaugh GP May 12th (4). Broads: Hickling May 10th, 12th (6), 14th (8), 16th (11), 18th (6) and 25th (2) and June 4th and Hardley Flood May 11th (3).

Autumn: North: Cley 1-6 July 19th to Oct. 14th. Holme July 25th to Oct. 15th and Titchwell Sept. 28th (15). Broads: Hickling 1-7 July 24th to Oct. 8th, Cantley Aug. 7th (3). Fens: Wisbech SF 1-5 mid-July to mid-Oct.

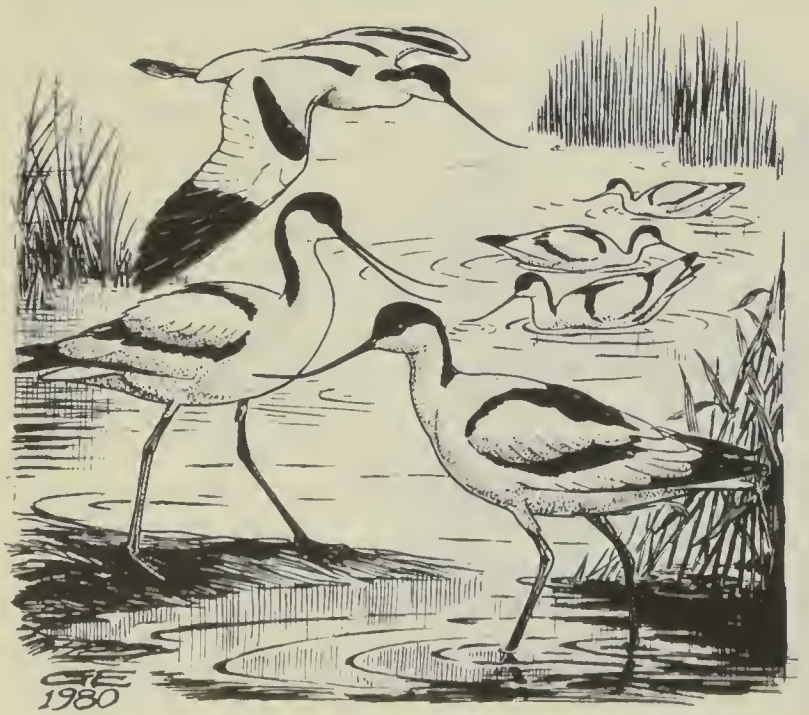
Temminck's Stint: North: Cley May 10th-14th (3), 23rd-25th (2), 26th-30th, June 4th (2), Aug. 25th and Sept. 16th. East: Breydon May 28th. Broads: Hickling May 8th (3), 10th (4), 12th-14th (7), 16th (10), 18th (9), 24th (4), 25th (3), 26th, 28th (2), Aug. 10th (3) and 20th.

White-rumped Sandpiper: North: Cley/Salthouse 2 Aug. 1st-12th, then one till 31st and Oct. 30th to Nov. 2nd (many observers). Titchwell Oct. 11th/12th (PWA NS).

Pectoral Sandpiper: North: Cley Sept. 13th-21st (many observers). Inland: Lyng Easthaugh GP Sept. 6th (BB JDG JBK NM).

Curlew Sandpiper: *Spring:* East: Breydon 2-3 May 27th-31st. North: Cley May 13th/14th (2), 16th (4), 20th (3), 22nd (3), 25th, June 4th-5th (2) and 29th. Holme May 24th-25th.

Autumn: Broads: Hickling July 30th (10), Aug. 8th (14). Inland: Lyng Easthaugh GP July 30th. North: Present from July 21st including 34 Cley, 25 Holme and 15 Titchwell. Wash: Snettisham July 26th-Sept. 1st including 23 Aug. 2nd. Fens: King's Lynn BF 1-7 July 28th to Sept. 1st; Wisbech SF 1-3 July 26th to mid-Oct.



Purple Sandpiper: Recorded Bacton Gap, Cley, Gorleston, Happisburgh, Heacham, Horsey, Hunstanton, Paston, Salthouse, Sheringham, Snettisham, Titchwell, Weybourne and Yarmouth. Totals include 8 Bacton up to Feb. 17th, 8 Happisburgh March 2nd, 10 Hunstanton Dec. 29th, 1-4 Gorleston Nov.-Dec., 6-8 Paston Nov. 21st onwards and 5 Yarmouth Jan. 1st.

Dunlin: Wash: Snettisham peak of 7,050 in Jan. and 5,910 in Sept.

Broad-billed Sandpiper: East: Breydon May 27th-30th (PRA *et al*).

Buff-breasted Sandpiper: Wash: Hunstanton cliffs car park Oct. 5th (DJG) and Salthouse Oct. 5th (DB JRM *et al*).

Ruff: Broads: Hickling 26 Jan.-Feb., 26 Aug. 31st, 52 Sept. 22nd and 24 Nov. 6th and Buckenham 30 Dec. 7th. North: Cley 100 Sept. 12th and Titchwell 40 Sept. 14th. Wash: Snettisham autumn peak 40. Fens: West Walton 25 July 19th; Welney 30 wintered and in spring 6 males and 8 females holding territory; Wisbech SF present June to Oct. with 120 Aug. 15th.

Jack Snipe: Extreme dates May 10th and Sept. 1st (both at Hickling).

Woodcock: Roding at Brettenham, Briston, Catfield, Didlington, East Tuddenham, Emily's Wood, Foulden Common, Lopham Little and Middle Fens, Roydon and Swaffham Heath.

Black-tailed Godwit: Breeding season: Fens: Welney 45 returned mid-Feb. and over 100 in early April; at least 11 pairs holding territory end of month. North: Cley pair accompanied by 2 chicks May 25th. East: Acle Marshes pair displaying April 6th.
Autumn: 205 on Wash near Lynn Aug. 2nd; Cley 22 Sept. 20th.

Bar-tailed Godwit: Wash: Snettisham peak of 4,100 in Jan. and 3,500 in Aug. Inland: Lyng Easthaugh GP 3 May 4th.

Whimbrel: Early spring date March 15th (at Horsey).

Curlew: Wash: Snettisham peak of 1,110 in Feb. and 1,600 in Aug. Brecks: At least 6 breeding pairs.

Spotted Redshank: Wintering: 2 at Cley Jan.-Feb. and one Dec. Autumn maxima Cley 27 Aug. 23rd, Hickling 15 Aug. 8th, Holme 9 Sept. 28th and Wisbech SF 11 Aug. 31st.

Redshank: Wash: Snettisham peak of 1,870 in Feb. and 3,510 in Oct.

Greenshank: In winter 2 at Thornham/Titchwell/Brancaster (a regular feature since 1974) in Jan./Feb. and one at Cley/Salthouse in Dec.. Largest parties in May: Cley 14 and Hickling 10. Autumn maxima Cantley 15, Cley 16, Scolt Head 20, Titchwell 11, Holme 20, Snettisham 55, Terrington Marsh 11 and Wisbech SF 25.

Green Sandpiper: In winter at Fincham, Grimston, Lyng Easthaugh, Marham Fen, Narborough and Pott Row. Autumn maxima: Cley 12, Flitcham 11, Holme 10, King's Lynn BF 10 and Wisbech SF 12.

Wood Sandpiper: *Spring:* 1-2 at Cley, Hardley Flood, Holme, Lyng Easthaugh, Strumpshaw and Titchwell. *Autumn:* Cley 50 July 31st, Cantley 11 Aug. 10th, Holme 10 Aug. 16th and Wisbech SF 19 Aug. 8th.

Common Sandpiper: Breeding: A pair in Fens with single young in June. Central: one nest found. Autumn passage maxima: Holme 30, King's Lynn BF 15 and Wisbech SF 30.

Turnstone: Wash: Snettisham peak of 401 in Jan. and 810 in Sept.

Red-necked Phalarope: East: Breydon May 11th. North: Cley May 14th-16th and Holme Aug. 5th-8th.

Grey Phalarope: North: Cley Nov. 30th and Titchwell Nov. 30th-Dec. 1st.

Pomarine Skua: North: Hunstanton Oct. 4th and 12th, Holme 2 Sept. 10th, 5 on 11th and 2 on 12th, Titchwell Aug. 15th, Sept. 15th, Blakeney Point Aug. 15th/16th, Cley Aug. 21st, 2 on 23rd, Sept. 3rd, 11th, 13th and 20th, Sheringham March 15th, 2 March 19th, Aug. 19th, 4 on 31st, Sept. 2nd, Oct. 16th, 5 on 17th, 18th and Nov. 18th, Cromer Nov. 12th, Paston 2 Aug. 31st, Sept. 1st, 5 Nov. 9th, and 2 on 29th. East: Bacton March 18th and Nov. 9th, Horsey Oct. 4th, Winterton Aug. 28th, Sept. 21st and Oct. 12th.

Arctic Skua: N/E coasts: Two Jan. records: Sheringham on 3rd and Cley on 5th. Unusual spring movement April 20th when 12 off Cley, 6 off Holme and 2 off Hunstanton. Most impressive movements towards end of Aug.: on 22nd 125 off Holme; on 30th 73 off Hunstanton and on 31st 35 off Paston and 40 off Sheringham. A further 80 passed Holme Sept. 11th. Late movement of 20 at Sheringham Dec. 6th.

Wash: Snettisham 46 Sept. 13th; 100 passed inland at Nene Mouth and then over Wisbech SF Sept. 14th. A unique observation.

Long-tailed Skua: North: Blakeney Point Sept. 28th (KKH), Weybourne Aug. 22nd (NRR), Sheringham Aug. 31st (KBS MPT). East: Winterton Nov. 22nd (PRA TEB). Additional 1979 record of juvenile Cley Sept. 15th (IRM, JPM).

Great Skua: N/E coasts: One winter record: Hunstanton Jan. 2nd. Interesting spring movement April 20th (see Arctic Skua) when 4 at Cley, 2 at Sheringham and 3 at Holme. Autumn records from July 10th (Titchwell) where one killed a Guillemot on 21st. Main autumn passage from late Aug. with maxima for each area: East: Winterton 12 Oct. 15th; North: Paston 13 Oct. 11th, Mundesley 8 Oct. 18th, Sheringham 21 Aug. 31st., Cley 10 Oct. 4th, Holme 31 Aug. 22nd and 20 on 23rd and Hunstanton 16 Oct. 4th.

Wash: 50 heading inland at Nene Mouth and passing over Wisbech SF Sept. 14th. A remarkable record.

Mediterranean Gull: East: Yarmouth/Gorleston Aug. 10th-15th, Sept. 10th, Oct. 31st to Nov. 29th; Breydon May 31st and Waxham Nov. 8th. Broads: Hickling April 23rd. North: Paston March 2nd, Sheringham July 7th-18th, Cley March 29th, Titchwell June 4th and Oct. 22nd. Wash: Snettisham, a sub-adult May 9th-June 13th and again June 25th-27th displayed vigorously to Black-headed Gulls and through its actions prevented 25 pairs from breeding.

Little Gull: Recorded each month, but only 3 Jan. records: Downham Market on 1st, Cley on 2nd and University Broad Norwich on 6th. At Titchwell present all summer, mainly immatures including 4 in April, 3 in May, 8 in June and 12 in July. Autumn coastal movements from Aug. to late Nov. including the following Nov. peaks: Cley 55 to east on 2nd, 23 on 3rd; Mundesley 33 on 1st; Paston 154 east on 1st, and 46 on 2nd; Winterton 52 south on 9th and Gorleston 47 south on 1st.

Additional 1979 records of one off Sheringham Dec. 19th and 4 on 22nd confirm present each month that year.

Sabine's Gull: East: Winterton Oct. 12th. North: Mundesley Nov. 9th; Sheringham July 7th-21st feeding mainly inland but also on scraps provided by bird-watchers; Cley Jan. 1st; Brancaster Staithe Sept. 28th and Holme Sept. 28th and Oct. 4th. Wash: 2 in southern sector Sept. 25th.

Black-headed Gull: Breeding totals of pairs as follows: Cantley 520, How Hill 80, Hickling 7, Blakeney Point 200, Scolt Head 280, Snettisham 250 and Wissington BF 80.

Lesser Black-backed Gull: Broads: Hickling, one pair nested unsuccessfully.

Iceland Gull: North: Salthouse Feb. 23rd and Oct. 25th; Holme March 27th.

Glaucous Gull: The familiar Blakeney to Sheringham adult present until March 8th and from Aug. 21st (17th consecutive winter); it was joined by a second adult March 2nd. Other occurrences in this area included 5 first-year birds at Sheringham Jan. 2nd. Additional records from Gorleston, Winterton, Horsey, Sea Palling, Bacton, Paston (3 March 20th), Wells/Holkham (Oct. 15th), Titchwell (adult April 18th-27th), Holme and Heacham/Hunstanton. Observed up to April 27th and from Sept. 21st. Away from coast immatures at Stracey Arms (Bure Marshes) Feb. 3rd. Buckenham Jan. 12th-27th and Gt. Witchingham Dec. 22nd.

Gull-billed Tern: North: Titchwell July 7th-27th (many observers); also visited Scolt Head ternery where 12 Ringed Plover chicks taken. Additional 1979 record at Cley July 20th (GLW, MGW).

Caspian Tern: Broads: Hickling June 2nd (ADB). North: Cley Aug. 26th (JIM JP-S MW).

Sandwich Tern: North: Blakeney Point 2,300/2,500 nesting pairs raised 1,800 flying young; Scolt Head 1,200 pairs raised 750 flying young. First at Titchwell March 27th and last at Hunstanton Nov. 1st. East: Breydon peak in autumn 800 July 24th. Fens: 4 Wisbech SF Aug. 15th.

Roseate Tern: North: Sheringham July 12th (MPT) — the sole record.

Common Tern: Breeding pairs (young raised in brackets): East: Breydon 33 (32). Broads: Martham 1 (1), Hardley Flood 29 (35), Hoveton Great Broad 4, Ranworth 38 (60) and Hickling 16 (15). North: Blakeney Point 550/600 (50), Scolt Head 280 (10), Burnham Overy 2, Thornham Point 2, Stiffkey Binks 130, Bob Hall Sands 76, Overy Shingle Banks 2.

Wash: Snettisham 160 (17). Inland: Lyng Easthaugh GP 6 (12) and Colney GP 1 (3).

One remained at Ellingham Mill throughout the year (*per* PRA).

Arctic Tern: Extreme dates April 19th (8, Bacton) and Nov. 9th (Sheringham). Breeding: North: Blakeney Point 3 pairs (no young reared) and Scolt Head one pair (one young reared).

Little Tern: Recorded from April 14th (Holme). Breeding pairs (numbers of fledged young in brackets): East: Winterton-Horsey Gap 6 (3). Broads: Hickling 19 (5). Nor-

th: Blakeney Point 120/150 (8); Stiffkey Binks 37, Stiffkey Freshes 10/12, Bob Hall Sands 19, Wells/Holkham 14/15 (few), Scolt Head 68 (5), Brancaster 14 (4-5), Burnham Overy 29-30, Thornham 30-35, Titchwell 37.

Unusual June movements at Paston include 40 west on 1st and 60 west on 29th. Inland, Lyng Easthaugh GP April 20th, Strumpshaw June 15th and Wisbech SF 1-4 in late July.

Black Tern: An early spring passage began April 13th when 4 at Welney, 3 Burnham Overy, 4 Cley, 3 Hickling and 3 Waxham. May 9th brought 37 to Breydon with 3 at Filby and 2 at Cley increasing to 32 there on 11th. A large movement occurred May 13th-15th especially on 14th following strong overnight easterly winds. Numbers included 4 Snettisham, 32 King's Lynn BF, 4 Holme, 4 Brancaster Staithe, 30-50 Titchwell, 250 Cley, 15 Sheringham, 4 Winterton, 12 Flegg Broads, 250 Hickling at sunset after only 2 on 12th and 30 again on 16th, 2 Rockland and 4 St. Germans.

Two remained at Titchwell June 20th to July 14th where 28 on 30th. 1-2 in June/-July at Hardley, Cley, Holme and Snettisham.

Small autumn passage and no party exceeded 12. Late birds at Snettisham Oct. 11th and 18th.

White-winged Black Tern: East: Happisburgh Sept. 3rd (KB). North: Holme-Titchwell Oct. 17th-31st (many observers).

Guillemot: North: Sheringham 650 to east March 19th, an unusual time of year for such a movement.

Black Guillemot: East: Winterton Feb. 9th. North: Cley Channel Jan. 1st-Feb. 13th, Sheringham Sept. 20th and Oct. 18th and Holkham (dead) Nov. 30th.

Little Auk: East: Gorleston Nov. 5th, 2 on 6th and one 29th/30th; Winterton 12 Oct. 12th. North: Paston Nov. 30th, Cromer Nov. 12th, West Runton Jan. 27th. 5 dead birds Sheringham Dec. 6th, Salthouse March 29th and Holkham Feb. 8th; Brancaster Jan. 19th and Holme March 30th (choked with fishing line).

Puffin: Only 4 observations: North: Sheringham 2 Nov. 29th, Cley Oct. 2nd and 21st and Holme Nov. 26th.

Turtle Dove: Wash: Snettisham spring passage May 9th to June 16th with 160 May 10th and 84 June 5th. Wolferton 150 Aug. 16th. North: Holme 200 west May 20th and 80 west June 15th.

Ring-necked Parakeet: Singles at Breydon, Yarmouth, Winterton, Northrepps, Brancaster Staithe, Holme, Hunstanton, Norwich and Leziate.

Barn Owl: Recorded at over 80 localities.

Little Owl: Recorded at 40 localities.

Long-eared Owl: In contrast to 1979 34 sites with young calling — all but one in West Norfolk (JBK). Only additional breeding record at Salthouse Heath. Very early immigrant Sheringham Aug. 16th. In Oct. one in off sea Paston on 12th followed by singles at Yarmouth on 15th, Sheringham on 18th and Paston Nov. 1st. Small winter roost containing 3 birds known in NW Norfolk.

Short-eared Owl: Successful breeding pair at Scolt Head; unsuccessful nests at Breydon and Titchwell. In Oct. migrants off sea at Scolt Head 12th, Sheringham 18th and Hunstanton 31st. No winter concentrations, but 5 at Halvergate Marshes March-April.

Nightjar: Total of 51 birds, mostly churring, recorded at 15 West Norfolk localities in association with Long-eared Owl survey referred to above — most records from Brecks. Other specific records from this part of county include 7 singing males at

Leziate and 5 at Sandringham/West Newton. Elsewhere noted at Salthouse Heath, Kelling Heath (up to 4 birds), Winterton and Fritton (at least 6 birds). Late individuals at Wolferton Sept. 2nd and Leziate Sept. 3rd.

Swift: First recorded Cley April 27th. Total of 4,000 moving westwards Sheringham July 30th. Only three October records, the latest at Holkham on 5th.

Kingfisher: Recorded at well over 80 localities.

Hoopoe: Only recorded in Spring as follows: Salthouse Heath April 15th/16th, Holkham (Overy dunes and Gun Hill) April 16th/17th, Strumpshaw April 16th-21st, Middleton (2) May 5th-8th, Happisburgh May 12th-15th, Titchwell May 21st and Holme May 23rd/24th.

Wryneck: In April singles at Winterton on 13th and Cley on 27th. During May apart from two at Paston on 7th singles as follows: Winterton 7th & 10th, Swafield 12th, East Ruston 11th/12th, Cley 26th, Wells/Holkham 6 dates 3rd-18th, Scolt Head 10th, Holme 12th/13th and Tittleshall (near East Bilney) 11th. In Autumn following one at Stanhoe Aug. 17th total of at least 13 coastal migrants Aug. 26th-Sept. 8th at Winterton, Horsey, Paston, Sheringham, Weybourne (maximum of 3 Sept. 6th), Blakeney Point, Wells and Holme.

Woodlark: Brecks records from at least 9 localities in breeding season, a noticeable improvement compared with two previous years. Only one record elsewhere, Winterton May 25th.

Shorelark: In the main wintering area between Weybourne and Cley up to 40 recorded (end Jan.) in first winter period with latest 13 May 4th; in second winter period recorded from Oct. 21st with up to 35 by end Nov. Elsewhere: Hopton Oct. 31st/Nov. 1st, Winterton April 29th, Wells Jan. 5th, Holkham Oct. 21st, Scolt Head Oct. 12th and 10 Oct. 30th, Titchwell 2 Feb. 4th, Thornham 2 on 4 dates Jan. 13th-Feb. 24th and 2 Dec. 7th and Holme March 16th.

Sand Martin: Breeding records include 2-300 pairs in coastal cliffs at Trimingham and five unusual sites along R. Wensum at Norwich — four pairs nesting in pipes and one pair in a wall. October records at Cley on 11th and Norwich (2) on 29th.

Swallow: A huge roost, possibly up to 100,000 birds, at Titchwell in latter half of Sept. November records at Winterton on 16th and Wells on 18th, 20th & 21st.

House Martin: Complete albinos at Sheringham Aug. 2nd and Cromer Sept. 3rd (same individual?). Late November birds at Cromer 22nd/23rd, Sheringham 24th and Paston 27th.

Richard's Pipit: The wintering individual first seen at Cley 21st Dec. 1979 last seen Jan. 15th. The first county spring record, Winterton March 30th-April 17th (ADB GED *et al*).

Tawny Pipit: North: Weybourne April 12th-14th (MH MPL RT *et al*). Additional 1979 record: East: Winterton two Sept. 30th (PRA).

Red-throated Pipit: East: Breydon June 1st (PRA, ADB, GED).

Rock Pipit: Birds of Scandinavian race *littoralis* at Cley (6) March 22nd & Sheringham March 30th.

Water Pipit: At Hickling noted Jan. 18th, Feb. 18th, March 12th, 2 March 23rd, Oct. 23rd, Nov. 1st and 26th. At Cley 2 Jan. 6th, Jan. 15th, March 22nd, Nov. 9th and 22nd. Elsewhere: Thornham March 25th, Cantley BF March 26th, Bacton April 13th, Horsey Nov. 9th and up to 4 Strumpshaw throughout Dec. at newly constructed broad.

Yellow Wagtail: First recorded at Holme March 23rd. An Autumn roost of up to 300 birds Stow Bridge Aug. 11th-27th.

Blue-headed Wagtail: Spring records as follows: Tottenhill April 19th, Holme 2 April 30th, Strumpshaw & Costessey May 5th, Breydon May 25th, Hickling May 28th and 2 June 7th, Rockland June 1st and Potter Heigham 2 June 2nd. Two Autumn records: Stow Bridge Aug. 27th and Cley Sept. 20th/21st.

Sykes's Wagtail: A male showing the characteristics of this race at Hickling May 31st (IKD).

Grey-headed Wagtail: A total of at least 5 records in May: Strumpshaw on 5th, Cley on 16th, Riddlington on 18th and Hickling 2 24th & 28th, with one on 30th.

Citrine Wagtail: Fens: Welney within Wildfowl Trust reserve Nov. 16th/17th. (TI *et al*). The first county record of this Fair Isle speciality breeding in Siberia.

Grey Wagtail: An increased number of breeding localities received with records from R. Nar (4 pairs with young), R. Wensum (Norwich) and at the following Mills:— Fakenham, Keswick, Marlingford, Shotesham, Taverham and West Acre.

Pied Wagtail: Roosting records include 50 at Titchwell in Feb., up to 100 at East Tuddenham early Autumn and up to 600 being preyed upon by Little Owls in two heat exchangers at Bacton Gas Terminal in Nov.

Waxwing: Only one record. West: 3 Gayton Thorpe Jan. 21st.

Dipper: Central: Bawburgh Mill Nov. 17th-Dec. 3rd of British/Central European race.

Nightingale: During 1980 breeding season recorded at the under-mentioned sites. Unless otherwise stated, records are of single singing birds: Alderford Common 7, Attlebridge Hills, Bacton, Bawsey Carrs 2, Beachamwell, Beetley 3, Blackborough End 3, Bodney Village, Bodney Church, Bodney Lodge 2, Brancaster, Brandon Decoy, Brandon Staunch 3, Buckenham Tofts Mill 2, Buckenham Tofts Park 7, Caldecote, Castle Rising and White Hills Wood, Congham Gorse Moor, Costessey GP, Cranwich Hall 2, Didlington, Didlington Coldharbour, Ditchingham Broome Heath, Dunston Hall 2, East Bilney, East Walton 9, East Winch 6, Felmingham Bryants Heath 3, Felthorpe, Feltwell Common 3, Foulden Common 25, Foulden Field, Foulden Hill 4, Fundenhall Street, Gayton Brink Hill 2, Gayton Thorpe Common 8, Gayton Soigne Wood 3, Gooderstone 2, Great Cressingham 4, Gresham Hall, Gresham Rounce Covert 3, Hilborough Woods and Hollow Heath 10, Hilborough Hall 4, Hilgay Wood Hall 8, Hockham Frosts Common 2, Ickburgh 2, Leziate, Little Cressingham Maggotbox, Little Cressingham Cadogan Plantation, Lynford Long Water 2, Lyng 2, Marham Fen 7, Merton Woods 4, Mickle Mere 4, Narborough Big Wood 7, Narborough Bradmoor 16, Narborough Low Road Belt 3, Narford 8, Needham, North Elmham Great Wood 2, Old Hunstanton, Oxborough 2, Pentney Ashwood Lodge 3, Pentney Hoveringham GP 2, Postwick, Pott Row Sugar Fen 4, Ringland Lakes 5, Rockland Broad, Roydon Common 7, Salthouse Heath 6, Saxthorpe, Shropham Tuzzy Muzzy, Snettisham Common 3, Snettisham Locke Farm 2, South Acre Big Wood 4, South Lopham Fen 2, South Lopham Little and Middle Fens 3, Sparham, Stanford Church 2, Stanford Water 4, Starston Kiln, Stiffkey, Stoke Ferry Fen, Sturston Carr 4, Swaffham, Swaffham Heath 2, Swannington, Swannington Hingrave, Tacolneston, Taverham Heathwoods Nursery 3, Thetford Barnham Cross Common, Thetford Elder Hill 2, Thompson Water 6, Thorpe Great Heath, Tottington Madhouse Plantation 4, Tottington Waterhouse Plantation 6, Upton Doles, Weeting 2, Weeting Emily's Wood 3, West Acre Mink Belt 2, West Acre Wales Covert 5, West Harling Common, West Wretham Galley Hills 2, West Wretham Rush Mere, West Wretham Belt 2, Wells 2, Weybourne Camp, Weybourne Muckleborough Hill 10, Wickmere, Witton Common, Wortwell and Wretton.

The final county total was 345 singing males. The remarkable total of 25 from Foulden Common (300 acres) was recorded by C. Mead and K. Smith of B.T.O. on the night 22nd/23rd May. Greatest density in West Norfolk was to the west and south-west of Swaffham; in the East, the western approaches to Norwich were most rewarding (ALB).

Bluethroat: Males of red-spotted form at Winterton and Cley both on May 17th. No autumn records as in 1974.

Black Redstart: Breeding season: Yarmouth (Southtown) 7 singing males with 4 pairs proved breeding and unaccompanied males Weybourne April-June and Norwich May-July. Spring passage March 22nd-May 26th with maximum of 3 Happisburgh May 5th. Four isolated early autumn migrants from Aug. 18th onwards, but main return passage Oct. 11th-Nov. 10th with maximum of 3 Wells Oct. 16th.

Redstart: Breeding records received from Aylmerton, Felbrigg, Sandringham, Santon Downham and Sheringham.

Whinchat: Breeding: Pairs present at Brettenham, Bridgeham Heath (2), Frog Hill (2), Gooderstone Warren, Leziate, Stanford, Sturston Warren, Tommy's Belt and Tottington. Late October migrants at Wells 17th, Brancaster 18th, Happisburgh 20th and Titchwell 26th.

Stonechat: Breeding: Brecks: Pairs at Bridgeham Heath, Frog Hill & Grimes Graves. North: Pairs at Cley & Weybourne: East: 10 pairs Waxham-Winterton.

Wheatear: Extreme dates March 22nd (Holme) and Nov. 16th (Snettisham). Unsuccessful breeding at Snettisham but at least 2 successful pairs at Leziate.

Ring Ouzel: Late March arrivals at Cley and Weybourne on 25th and Winterton on 30th/31st. Spring passage continued until May 26th with largest concentration 17 at Caister April 30th. At Ebridge 3 birds remained from April 21st to May 12th, an unusually long period for such a passage migrant in Spring. Isolated individuals in mid-June at Saxthorpe and Winterton. Only small-scale Autumn passage of singles Sept. 23rd-Nov. 8th with exception of 15-20, with a major thrush arrival at Holkham Oct. 17th.

Fieldfare: A cinnamon-coloured bird at Attlebridge throughout January. June records from Bacton and Thurlton on 1st and Cockley Cley on 16th. August records from Pott Row on 16th, Swaffham on 18th & Cley on 28th.

Redwing: Late Spring migrants at Brancaster and Burgh Common on May 18th and Winterton on May 25th. Return passage commenced Sept. 20th (Holme).

Cetti's Warbler: Broads: In main breeding area in Yare Valley singing males at Brundall (1), Surlingham (6), near Coldham Hall (2), Wheatfen (8) and Rockland/Strumpshaw (12 — no increase on previous year). Elsewhere: singing males at Acle (Damgate) March-April, Ranworth (2) April-June, Hardley Flood April-June and Oct.-Dec. (2), Ludham (Womack Water) May and Fritton from May and again in autumn. Also 2 Cantley BF end Aug.

Savi's Warbler: North: Cley April 16th-May 9th. Broads: Strumpshaw, one pair almost certainly bred. Martham Broad 4 males in song and Horsey 2 males in song. Hickling first arrival April 11th increasing to 4-6 regular singing birds, all probably holding territory — 2 additional males arrived in June when up to 8 birds in song.

Reed Warbler: A late migrant East Runton Nov. 9th.

Icterine Warbler: One Spring record, a male in song Cley April 11th (A & JM), only the second since 1964. Total of eight autumn migrants: Cley Aug. 27th, Blakeney Point Aug. 15th & 31st, Wells Sept. 4th, Holkham a late individual Oct. 14th/15th, Titchwell Aug. 17th & 27th and Holme Aug. 24th.

Lesser Whitethroat: North: Individual of Siberian race, *blythi,* trapped Sheringham Oct. 12th and birds showing same characteristics at Wells Oct. 12th & 14th.

Sardinian Warbler: North: Weybourne Sept. 2nd to at least Oct. 5th. The second county record of this common Mediterranean species, the first occurring in 1973.

Barred Warbler: East: Gorleston Sept. 4th and California Sept. 5th. North: Weybourne Sept. 1st & 21st, Holme Aug. 25th and 3 Sept. 1st, one remaining until the 8th, and Hunstanton Sept. 1st.

Garden Warbler: Latest record, Wells Oct. 18th.

Blackcap: Reports received of at least seven wintering birds: Ingoldisthorpe Jan. 2nd, Gayton Jan. 12th and another Jan. 26th, Sheringham Jan. 29th, Gorleston Jan. 29th/30th, Wells Feb. 1st & 7th and North Walsham March 8th. Noticeable influxes of at least 50 birds at Wells/Holkham Oct. 12th & 17th. Correction to 1979 Report: Third line should read 'Gorleston Jan. 24th & Holme Feb. 17th'.

Pallas's Warbler: East: Waxham one trapped Oct. 31st (JH), remaining until Nov. 8th. Second bird present Nov. 2nd-6th.

Yellow-browed Warbler: East: Waxham Oct. 19th/20th (trapped) and Winterton Nov. 9th. North: Wells/Holkham Sept. 28th, 29th (2) & 30th, Oct. 11th/12th (2) & 13th and Nov. 8th, 9th (3) and 10th-12th.

Wood Warbler: Breeding season records of singing males from Kelling (2), Weybourne, Snettisham (4), South Wootton and Mousehold Heath, Norwich (4). Two pairs bred at last named locality (one successfully) and one pair also bred Sheringham. Autumn migrants at Holme Sept. 3rd, Cley Sept. 7th and Winterton Sept. 21st.

Chiffchaff: Wintering birds at Narborough Jan. 1st-13th and Horsey Jan. 24th. A noticeable influx of birds of Northern races (*abietinus* and *tristis*) from Oct. 12th until early Nov. with small numbers on both east and north coasts, especially at Wells/Holkham.

Firecrest: An early migrant at Holme March 16th followed by a small number of records March 31st onwards on 1/2 birds including inland sites at Ebridge and Norwich. Up to 4 singing males at both Sheringham and Wells/Holkham during May but no evidence of breeding. Autumn passage commenced on a small scale Sept. 29th with an unprecedented influx Oct. 31st extending into mid-Nov. on east and north-east coasts with records from Yarmouth (3), Caister (3), Winterton (3), Waxham (3), Hempstead, Happisburgh (3), Paston, Trimingham and Cromer (2). Subsequently 2 inland Filby Nov. 17th.

Red-breasted Flycatcher: One Spring record = Holme, an immature male singing in pines May 27th. In Autumn singles Wells/Holkham Sept. 29th/30th, Oct. 11th-13th with an additional bird on 12th and a fourth individual Oct. 18th/19th. Also one trapped Sheringham Oct. 11th.

Pied Flycatcher: Only small-scale Spring passage with records from Cromer April 30th, Wells/Holkham (up to 3) May 1st-5th, Kelling May 10th, Titchwell May 11th, Holme May 12th and Blakeney Point May 24th.

Bearded Tit: Breeding localities (pairs where known in brackets) included: Broads: Hickling (111), Horsey (50), Martham (6), How Hill (6), Ranworth (2), Cantley BF (5), Strumpshaw (1), Belton Marshes (5) and Somerleyton (1). North: Cley (40-50), Burnham Norton (2/3), Brancaster and Titchwell (15-20). Wash: King's Lynn area (2). Records of autumn migrants away from breeding areas include 8 Weybourne Sept. 29th, 14 east Holkham Oct. 15th, 13 east Brancaster Staithe Sept. 23rd and a further 9 east Oct. 14th, 4 Snettisham Oct. 4th and 2 Oct. 17th, 28 Holme Sept. 26th and 20 in October, 20 Reedham Oct. 14th and 25 King's Lynn Beet Factory Nov. 23rd.

Willow Tit: One showing the characteristics of the southern Scandinavian race *borealis* Sandringham Nov. 23rd (MC). The first reported county record of this race.

Long-tailed Tit: One showing the characteristics of the white-headed Northern race *caudatus* Hopton Nov. 10th (BAC).

Golden Oriole: Sheringham May 21st/22nd, Titchwell May 31st, Holme June 1st, Hicking (2) June 8th, East Tuddenham June 29th and Winterton July 5th. Also breeding season records from three localities in Fens/Breck.

Red-backed Shrike: Spring migrants at Cromer May 25th and June 1st and Holme May 29th/30th. Breeding season records only from Brecks and at one North coast locality where an unmated male held territory for two weeks. A male Titchwell July 24th-27th. Autumn migrants at Winterton Sept. 1st, Cromer (2) Sept. 30th and Oct. 1st, Sheringham Sept. 2nd, Weybourne Aug. 26th-Sept. 8th with 2 Sept. 6th, Wells Oct. 5th and Thornham Oct. 12th.

Great Grey Shrike: In first winter period only regularly recorded at Strumpshaw and Roydon Common with other records from Hempton in Feb., Thetford and Bridgeham Heath in March, and a late migrant at Caister April 30th. Autumn arrival commenced Oct. 14th (Cley) with records from eight other localities in second winter period including two at Wells in early Nov.

Nutcracker: North: 1979 observation at Itteringham Sept. 23rd (AEP).

Carrion Crow: West: Traditional winter roost at Roydon Common contained 250 birds Jan. 1st.

Hooded Crow: In first winter period occasional records at a variety of localities up to May 3rd with maximum of 5 Winterton April 13th. One Sheringham June 1st. In second winter period records from Oct. 16th but only regularly noted at Roydon Common roost where maximum of 5 Nov. 8th.

Brambling: Several flocks containing hundreds of birds in various parts of Norwich in second half of December.

Serin: North: Cromer male May 24th/25th (PL *et al*).

Siskin: Breeding confirmed at Sheringham and Mundford, but singing males in summer at several other Breck localities and also at Wells/Holkham. Largest concentration 200 Langford Hall Feb. 24th.

Twite: Wintering coastal flocks included 300 at Morston, 100 at Wells, 500 at Scolt Head and 200 at Titchwell.

Mealy Redpoll: Up to 5 Wells/Holkham in January and one Swaffham Forest April 12th.

Crossbill: Successful breeding noted at Sheringham, South Runcton, Wells/Holkham and Brecks: also regularly recorded throughout year at Snettisham (Ken Hill woods). Occasional records from a variety of West Norfolk localities but only one record from East: Lound Aug. 1st.

Hawfinch: Brecks: Only regularly recorded at East Wretham where three nests found and maximum count of 151 Feb. 11th. Also records from Cockley Cley, Gooderstone, Hilborough, Methwold, Micklemere, St. Helen's Well, Santon Downham and Weeting. Elsewhere East Tuddenham Sept. 21st, Freethorpe Nov. 19th, Fritton 2 Nov. 2nd, Gasthorpe 2 May 2nd, Wells/Holkham 2 March 3rd, 2 Sept. 25th and Oct. 16th, and Weybourne June 10th and Sept. 22nd.

Lapland Bunting: In first winter period many more records than usual from numerous localities with maxima of 130 at Halvergate Jan. 27th and on the coast 25 at Cley Feb. 26th and 14 Burnham Norton Jan. 31st. Late summer-plumage males at Cley, Salthouse and Kelling on April 27th (same individual?) and Titchwell May 3rd. Return passage commenced Sept. 27th (Cley, Kelling and Titchwell). Maximum concentration in second winter period 30-40 Burnham Norton Dec. 21st.

Snow Bunting: Largest flock submitted, 200 Cley Jan. 16th. One inland record, Buckenham Dec. 2nd.

Ortolan Bunting: North: male Cley May 15th/16th. No autumn records for third successive year.

The following, not mentioned in the Classified Notes, were also recorded in 1980 *(breeding species in italics): Canada Goose, Mallard, Kestrel, Red-legged Partridge, Grey Partridge, Pheasant, Moorhen, Coot, Ringed Plover, Lapwing, Snipe,* Common Gull, Herring Gull, Great Black-backed Gull, Kittiwake, Razorbill, *Stock Dove, Woodpigeon, Collared Dove, Cuckoo, Tawny Owl, Green Woodpecker, Great Spotted Woodpecker, Lesser Spotted Woodpecker, Skylark, Tree Pipit, Meadow Pipit, Wren, Dunnock, Robin, Blackbird, Song Thrush, Mistle Thrush, Grasshopper Warbler, Sedge Warbler, Lesser Whitethroat, Whitethroat, Willow Warbler, Goldcrest, Spotted Flycatcher, Marsh Tit, Coal Tit, Blue Tit, Great Tit, Nuthatch, Treecreeper, Jay, Magpie, Jackdaw, Rook, Starling, House Sparrow, Tree Sparrow, Chaffinch, Greenfinch, Goldfinch, Linnet, Bullfinch, Yellowhammer, Reed Bunting* and *Corn Bunting.*

Offshore Observations

Sooty Shearwater: Six 30 miles NE of Yarmouth Aug. 31st (PRA) and one 10 miles north of Brancaster Aug. 9th (JB).

Storm Petrel: Eleven miles N of Brancaster Sept. 16th (JB).

Leach's Petrel: Thirty miles NE of Yarmouth Sept. 12th (PRA).

Grey Phalarope: Sixteen miles off Brancaster Aug. 28th (JB).

Pomarine Skua: Sixteen miles N of Brancaster Oct. 3rd (JB)

Long-tailed Skua: Adult and immature 15 miles N of Brancaster Sept. 4th (JB)

Little Gull: Twelve 12 miles N of Brancaster Oct. 13th (JB). Up to 14 Sept. 3rd to Nov. 29th 30-40 miles NE of Yarmouth (PRA).

Black Guillemot: Sixteen miles north of Brancaster Oct. 10th (JB).

Slate-coloured Junco: Leman Gas Field (Shell Bravo gas platform 49-26T) 35 miles off Happisburgh May 24th. Released Holme May 31st (DA)

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Blackcap Migration in Norfolk

TO NORFOLK, the Blackcap is a widespread and fairly common summer visitor, breeding in woodlands, Broadland carrs and even large gardens. As a passage migrant it is scarce in spring but more plentiful in autumn, while the number over-wintering has increased during the last decade.

Since 1961, over two thousand have been ringed in Norfolk, the majority on the coast in late summer and autumn. Of these, over three-quarters have been trapped in the last ten years, reflecting not only an increase in ringing activity, but also a marked increase in abundance of autumn migrants. There have been 22 recoveries of Norfolk-ringed blackcaps, including ten abroad. In addition, 7 blackcaps have been controlled within the county, having been ringed in other parts of Britain as well as one ringed in Holland.

These recoveries and controls, along with other data collected in Norfolk in recent years, form the basis of this article. In addition it is described how the results from our own county fit into the already well-established pattern of migration in other parts of the Western Palearctic.

Arrival in spring

Blackcaps breeding in Britain are part of the western population which migrates on a SW — NE axis (see later). In Norfolk, the first Blackcaps are recorded at the end of March or early April, often as singing males in their breeding territories. As with many summer migrants, the females arrive a week or so later. New birds continue to arrive at their breeding areas throughout April and early May, although very few migrants are recorded at coastal sites.

There have been four spring recoveries of Blackcaps, of probable British stock, ringed in Norfolk the previous year. Three in Belgium were presumably birds preparing to make the short sea-crossing to south-eastern England, while one controlled at Beachy Head on 11th April had probably just made landfall in Britain. Another ringed at Dungeness on 1st May and controlled at Gillingham 18 days later supports this as the route by which some, if not most, of our spring Blackcap arrivals reach Norfolk.

Despite the paucity of spring passage records along the coast, two Blackcaps ringed at Cley and Blakeney Point in late spring, were recovered in the same summer at Fakenham and in Oxfordshire respectively. This suggests that at least some make landfall on the north Norfolk coast before continuing their journey westwards.

Blackcaps in summer

Relatively few Blackcaps have been ringed as breeding adults in Norfolk but, as with many summer migrants, there have been a number of controls in the same locality in subsequent years. Despite the fact that even fewer Blackcap nestlings have been ringed, one found dead in Algeria at the end of September had been ringed that summer in the nest in Mundford.

Autumn migration

The Blackcap is one of the species which shows a clear-cut migratory divide. In general terms, birds breeding in Scandinavia and to the east of 12°E, migrate in a south-easterly direction in autumn, whilst those from western Europe, including Britain, are south-west oriented.

From late July onwards, Norfolk Blackcaps move away from their breeding areas. Post-juvenile dispersal is often totally random at first and apparently in the "wrong" direction. This is well illustrated by a juvenile ringed in Gloucester in early September and controlled at Salthouse 19 days later, while one ringed in Essex in mid-month had moved due north to Titchwell after a week. Such movements, however, are probably exploratory journeys by the juveniles, information from which can be used the following summer when they return as breeding adults. Later, in common with the adults, they move towards the south-east corner of England (as shown by two recoveries in Essex later the same autumn), from where they migrate in a south to south-westerly direction towards the Pyrenees, probably overflying northern and central France.

There is also evidence that both western and eastern populations can be involved in September movements. Three Blackcaps ringed in Norfolk in September have been found the following year in East Anglia, whereas one ringed at Stiffkey in mid-month was recovered in Lebanon the following May.

By the end of September, most British Blackcaps have left the country and thereafter the majority of records refer to birds from the Continent. While small numbers of Blackcaps are a regular feature of late autumn along the Norfolk coast, larger numbers only occur with a north-easterly to south-easterly airstream, Robins and Goldcrests being the two most frequently associated "fall" species.

October recoveries give some indication of the route taken by these migrants. One ringed in Holland was controlled at Holme a week later and a Sheringham-ringed Blackcap was controlled at Titchwell two days later. As in September, both south-western and south-eastern oriented populations are involved and two Blackcaps ringed on the north Norfolk coast in October were found in France and Italy, respectively, that winter.

Blackcaps in winter

British Blackcaps winter in southern Iberia and North Africa, and from Norfolk there have been four recoveries within this area, one each in Spain and Algeria, and 2 in Morocco. Perhaps surprisingly, Blackcaps wintering in Norfolk, as in other parts of Britain, are almost certainly Continental birds. Evidence for this is that, following heavy late autumn falls, the number of Blackcaps recorded that winter is unusually high. This is believed to result from the settlement of reversed migrants, which cannot or do not reorientate, having found a suitable alternative wintering area.

In Norfolk, during the last 15 years, an average of 5 wintering Blackcaps have been recorded for each December to February period. Peaks of 17 and 13 occurred in 1975-76 and 1976-77, each of which followed record numbers of Blackcaps on the east coast of Britain in late autumn. To date there have been no winter recoveries in Norfolk of ringed Blackcaps.

Acknowledgements

I am most grateful to the British Trust for Ornithology for allowing me access to all the Blackcap recoveries in their files.

Moss Taylor

Breeding Long-Eared Owls in West Norfolk

RECORDS of breeding Long-eared Owls in Norfolk rarely exceed half-a-dozen sites in most years. This is due to the secrecy of the owls for much of the year. Winter birds are usually strictly nocturnal and breeding adults are less vocal than the Tawny Owl for example. Some flying birds in the daytime may be overlooked as Short-eared Owls (there is a strong similarity in flight) and breeding Long-eared Owls feeding young may become active prior to dusk.

A mid-summer survey in 1980 located a total of thirty-four sites with calling young, from one to three owlets per site with an average of two. Unfortunately, one nest was chopped down during forestry operations. However, the surviving owlet was hand-reared. All of the sites but one were east of a line south from King's Lynn to Downham Market and west of a line running from Burnham Market through Fakenham, Litcham, Watton and East Harling.

All sites were located by listening for the penetrating, far carrying hunger call of the owlets; roughly described as a drawn out squeak. This call is given with remarkable persistence throughout the night in June and July, the best months for discovering sites. In May some young will not yet be large and vocal while by August family groups will be splitting up and calling will cease. On still evenings this call is audible at 1.25 Km, especially by cupping one's hands to one's ears. The note is immediately distinct from the lower pitched, hoarse, disyllabic Tawny Owlet call, which has much less carrying power. Windy or rainy evenings greatly reduce one's ability to pick up calls at a distance. Though difficult to transcribe, that of a Long-eared Owl is a mournful "eeeeep" while a young Tawny Owl's call is a hoarse "chi-serp".

Breeding habitat

All sites, with one possible exception, were associated with conifer plantations. These varied from solid stands of Forestry Commission trees to isolated shelter belts of varying size on arable land. All the forestry sites, however, were next to clearings reflecting the species' need for open land to hunt over, as well as hunting by sitting and watching within the canopy.

The breakdown of habitat types of the Norfolk birds is described below:

Habitat description	Number of sites
1. Small plantation, copses, scattered trees on lowland heath and breck.	3
2. Extensive blocks or fragmented areas of coniferous forest.	21
3. Small plantations, sheltered belts, hedgerows on arable farmland.	10
Total	34

Interspecific competition

While engaged in the survey a total of forty-six sites with calling Tawny Owlets was discovered although no attempt had been made to search for this species. They just happened to occur in areas where the survey was taking place.

There were definite signs that Long-eared and Tawny Owls could not co-exist. The closest together that young of both species were heard calling was about 0.5 Km. Tawny Owls dominate and have been known to kill Long-eared Owls. It is significant that a previously regular Long-eared Owl site was unoccupied in 1980 when young Tawny Owls were present. Tawny Owls, while more numerous in deciduous or mixed woodland, were also found in pure conifer stands. However, they appeared to require more mature timber than the Long-eared Owls.

Human habitation

Long-eared Owls definitely avoided human dwellings. Many excellent copses, from the human point of view, failed to hold Long-eared Owls because of the close proximity of a house. Tawny Owls however will breed in gardens.

Long-eared Owl sites on average were 0.91 Km. from the nearest dwelling with extremes of 0.3 Km. to 2.3 Km. Even in these cases the nearest dwelling was usually an isolated farmhouse. There was only one obvious exception with houses on two sides at distances of 0.4 Km. and 0.6 Km. and a town centre only 1.0 Km. distant.

Disadvantages of survey method

Two disadvantages were immediately obvious.

1. The number of young present cannot be positively assessed. Under-recording of young is probable at some sites where the odd owlet in the brood is not calling.
2. The actual nest site cannot be pinpointed for accurate site description. Young Long-eared Owls soon move away from the nest. Speedy development of the wing feathers enables them to fly when the rest of their body is still downy.

Another possibility for the unwary is to over-record the number of sites. The far carrying call may be heard by a listener standing anywhere in a circle with a diameter of 2.5 Km. When one is moving around forestry areas at night it is possible to re-enter this circle and think one has a fresh site. To avoid this, a map should be carried and sites marked, so that one can judge one's later positions in relation to the sites.

Advantages of survey method

1. Only one visit necessary to establish successful breeding.
2. No disturbance to breeding birds at crucial egg-laying/incubation period.
3. Ease of locating sites. At no other time of year can Long-eared Owls be found so readily without methodically trudging through woodland looking for pellets and roosting sites.

General Discussion

Strangely enough only one site could be found in a 2 Km. wide band either side of the A 11, despite much of the area looking ideal. A railway line also runs along this band and it is speculated that the combined noise of the railway and all-night traffic on this major trunk road is too much for the Long-eared Owls. The single site in this band was 1.0 Km. from the A 11. A limited amount of traffic is certainly not objected to because at one site young Long-eared Owls moved into roadside ivied oaks, within yards of traffic, the birds being lit up by passing cars. This was a minor road however.

No doubt quite a number of sites have been overlooked. A further survey in June/July 1981 should hopefully produce a more accurate picture.

Observers finding Long-eared Owl sites in West Norfolk in 1981 are asked to forward Ordnance Survey reference number, number of young calling, and brief habitat description. No sites will be published, merely included in a total as in this article.

Briefly as a guide, one should look at conifer plantations and shelter belts, away from dwellings and Tawny Owls, during June and July. These night-time jaunts will be full of interest and reveal other species as well: Little Owls, Woodcock, Stone-Curlews, Nightjars and Grasshopper Warblers.

Finally, I should like to thank N. Williams and P. Feakes for help in locating sites in 1980.

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Moulting Shelducks on the Wash

THE RECENT discovery of Shelduck in wing moult on the Forth Estuary and the sighting of a large autumn flock on the Dee raised the possibility that the moulting habit was becoming more frequent on British estuaries. With a further rise in moulting numbers on the Forth, from 800 in 1977 to over 2,500 in 1979, it seemed unlikely that the Forth alone should share with Bridgewater Bay the exclusive feature of a proven moult flock.

In 1977 about 900 Shelduck were present on 1st September near the mouth of the Ouse. The loose flock included 150 juveniles (first summer) and over 700 second

summer or older individuals capable of flight. One small additional party of 12 which was approached by boat contained 5 flightless birds in full wing moult and although the date raised the possibility of earlier moulting by the larger flock it did not preclude (i) an early immigration from other British sites or overseas where moult could have been completed by mid August or perhaps (ii) a late stopover on the outward journey to the Heligoland Bight.

On 1st August 1980, I counted 2,270 Shelduck on the east Wash between the Ouse mouth and North Wootton saltings. By Ouse mouth there were 114 juveniles and 950 second-year and older birds in loose flocks which included 23 flightless adults, perhaps around the number expected as nurses for the ducklings. An additional tightly packed flock of about 1,300 birds off North Wootton saltings was mainly comprised of moulting adults with a maximum of 150 capable of flight. The absence of primaries in many, visible both at rest and when wing exercising, confirmed that this was a moult flock closely resembling that on the Forth in appearance and habits. A follow-up visit on 4th August yielded a count of 1,040 flightless birds at the same site off North Wootton (Bulldog Sand): this was perhaps a more accurate count owing to better views in calmer weather. The largest most closely observed group, containing 580 birds, showed equal proportions of birds with half-grown, quarter grown and nil primary feathers and less than 20 full-winged Shelduck, presumably about to drop their feathers. Evidently the moult was well advanced, the early date suggesting second-summer and failed breeding birds formed the bulk of the flock as is apparently the case on the Forth.

There have been frequent reports of Shelduck leaving the Wash on their moult migration and during late July 1980 parties of 5-20 could be seen moving to N and NE in the evening. Once the moult flock on the Wash had been confirmed I kept watch at Snettisham Beach from 19.00 to 20.45 on the clear evening of 5th August. Five parties, totalling 65 birds took off from the general area used by the moult flocks and moved overland to NE on a following wind. Clearly in spite of the establishment of a moult flock, 1,000-1,500 strong, many birds using the east Wash continue to pass on to the Knechtsand for moulting.

The close correspondence between the autumn population on the Forth and the numbers proven to be in moult suggests that total counts can provide simple if rough guides to the size of the moult population: strict comparability should not be expected however because of the differences in juveniles and passage numbers. The marked rise in the Shelduck population index in 1975/1976 was followed by a progressive rise in Bridgewater Bay and Forth populations and what was probably the establishment of the east Wash moult flock in 1977. To explain the subsequent fluctuations however, especially at Bridgewater Bay, a more detailed investigation is required.

It would be surprising if the only two large estuaries I have examined in detail were also the only ones to hold new moulting flocks. The Dee, Mersey and Essex/Thames and other estuaries also hold substantial winter flocks indicating very favourable conditions for Shelduck and remain in parts sufficiently undisturbed to provide the necessary security. Investigation of such sites especially in early August could demonstrate that moulting on the Forth and the Wash reflects a wider tendency for at least some Shelduck age classes to choose sites in Britain rather than the Knechtsand (Heligoland Bight) for their annual moult.

D. M. Bryant

Communal Roosting by Hen Harriers

IN RECENT years communal roosting by wintering Hen Harriers has become a regular feature on the north Norfolk coast and the following observations are at two of these roosts during the 1979/80 and 1980/81 winters.

The roosts lie some 7 Km. apart and as it is likely that they are chosen for their isolation and inaccessability, I refer to them as sites A and B throughout.

Site A is in a freshwater reedbed, the birds utilising flattened areas and roosting on raised platforms. The site is bordered to the south by farmland and to the east and west by fresh and saltwater marshes.

Site B is to the east and lies in the middle of an extensive saltmarsh. The site itself is on slightly higher ground fringed by *Suaeda* bushes, the birds roosting amongst Sea Couch grass.

The first birds usually arrive at the wintering grounds by late September/early October and some at least use the roosts from the outset. It is likely that these could include passage birds but by late October the roosts have reached their maximum wintering numbers. These have ranged from 6 at site A to 5 at site B, with an increase in numbers during the late winter/early spring period. This will be discussed later.

During the daytime some birds are observed hunting in the roost site area, especially at site B where it is suspected that all the birds spend each day in the vicinity of the roost. At site A however, judging from the direction of incoming birds in the evening, it is clear that the majority hunt inland, on occasions being seen up to 12 Km. from the roost. Fields of sugarbeet are especially favoured.

In the evening the birds arrive at the roost up to 1 hour 30 minutes before sunset, during which time they can be seen hunting (to date no prey has been seen to have been taken, though they have been seen to arrive with a full crop). The Harriers usually arrive singly or paired (male and female, two males or two females), these groupings being noted over a period of nights suggesting that the same hunting grounds are used by both. It is interesting to note that birds have been seen heading in the direction of site A (some 5 Km. away) 20 minutes before and 5 minutes after sunset, passing within 2 Km. of site B.

On occasions aerial activity may be seen, especially in a gusty wind, and at other times the birds assemble on the ground some distance from the roost before finally settling up to 45 minutes before to 20 minutes after sunset. At both sites they roost some distance apart, particularly at site B where the distance between some birds is approximately 350 metres, while at site A, although they show a greater tendency to settle in close proximity to one another, two main groups have existed up to 500 metres apart. It was noted that the birds from site B moved to roost in sand dunes 1 Km. away for a period of nights at a time coinciding with high tides in the evening.

Brief skirmishes with Carrion Crows are commonplace, their paths crossing as both go to roost. Other birds including Short-eared Owls and Marsh Harriers also cause concern. One spring evening a group of 3 female and a male Hen Harrier soared with a female Marsh Harrier, mobbing it and uttering loud "keke-keke-keke" calls as it dropped into the roost. Surprisingly, the Hen Harriers followed, settling close by to roost.

By February, with lengthening days, increased aerial activity is noted prior to roosting, with males and females engaging in bouts of soaring and chasing. For most of the winter males are not tolerated, the females chasing them off. At this time, however, both settle close to each other in the roost.

During late winter and early spring there were increases in the number of birds roosting, mainly at site A and more noticeable in the winter of 1979/80 when ringtails outnumbered males by 5 to 1. Most of the ringtails were considered to be females (juvenile males were only positively identified twice). From February onwards the roost increased to 4 males and 6 ringtails, the males all being second-year birds (distinct brown mantles showing). This increase has been noted again last winter (1980/81), the roost consisting of 2 males and 4/5 ringtails for much of the winter, but in March it contained 4 males and 4/5 ringtails with an interesting note of 2 males and a female roosting very close to each other and some distance from the main group on 25th February.

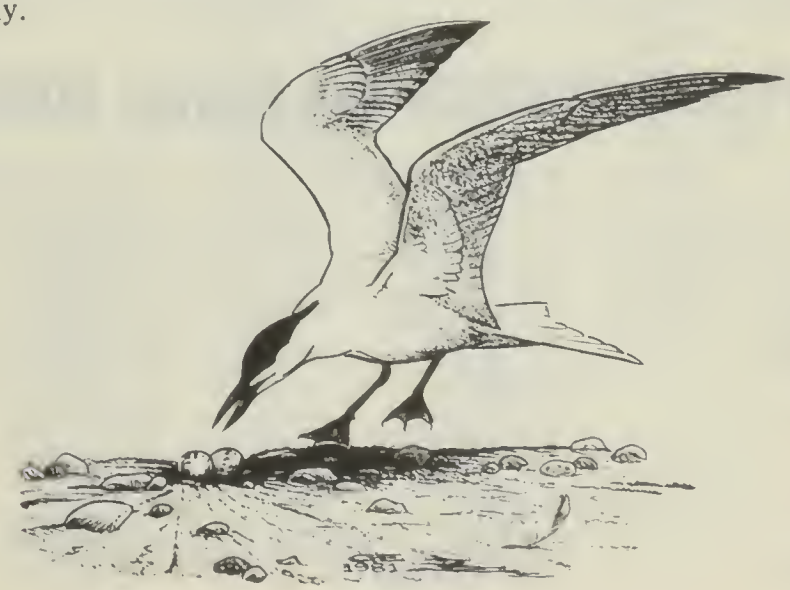
These increases being mainly additional males would seem to support the view (expressed by Donald Watson in *The Hen Harrier*) of a westerly movement of males from the Low Countries in January/February. Some spring records doubtless include birds passing out of the country and back to breeding grounds.

The roosts are deserted by early to mid April, but odd birds stay until early May and 2 females were soaring over site B on 4th May 1980.

John Brown.

The Titchwell Gull-billed Tern

ALMOST without exception Norfolk observations of Gull-billed Terns relate to individuals moving rapidly off-shore. Up to and including 1979 a county total of 42 has been recorded, the majority most probably from Denmark — the nearest breeding colony.



Bryan Bland identified a Gull-billed tern in the Titchwell tern colony on 7th July 1980 and this bird obligingly remained in the area for three weeks. During this unusually lengthy stay it was watched by scores of observers, providing an opportunity to record feeding habits.

Both Little and Common Terns were very aggressive towards the Gull-billed when it approached their nests and chicks. On the 8th it was seen to pick up a small Little Tern chick, but soon dropped it when driven off by the adults. On another occasion it seized a sitting adult Little Tern by the bill flying off with it dangling below. This was the only occasion it was observed harrassing an adult tern. However, during the early part of its stay the Gull-billed regularly seized Little Tern chicks. On the 9th a visitor reported it had injured a chick, but as far as is known this was an isolated incident. When dropped the chicks scampered off apparently none the worse for the experience. The Gull-billed was also noted picking up a dead chick on the edge of the colony and walking with it to the tide-line. Here it was washed only to be discarded. There was no evidence of killing any chicks.

The Gull-billed also had a taste for eggs and was first seen taking an egg from the tide-line on the 8th (a week earlier high tides had washed out several clutches of terns' eggs). Next day it walked up to a Common Tern's nest, seized and ate an egg. By mid-July the Gull-billed had changed its diet and began feeding on fish discarded by Little Tern chicks. Perhaps the adults were providing food too large to be swallowed.

The Gull-billed was content to take unwanted fish and was not observed chasing adult terns when they were feeding chicks. On no occasion was it seen fishing. Towards the end of its stay this rarity became more elusive, often heading towards Scolt Head where food supplies were doubtless more abundant.

The majority of Little and Common Terns had fledged and left Titchwell by late July and the Gull-billed was last recorded on 27th.

Colin Wells
(RSPB Assistant Warden)

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THE NORFOLK MAMMAL REPORT 1980

Editorial

The Editor is pleased to present the 25th Norfolk Mammal Report. On these numerically significant occasions it is customary to look backwards and forwards in time and, quite by chance, a number of events fall into these categories.

During the course of the year it was a great pleasure for the Editor to meet F. J. Taylor-Page who was doing so much a quarter-century ago to stimulate the study of mammals in Norfolk. He was editor or joint editor of the Report for many of its early editions which were typed out and issued as duplicated pages. For some years now he has lived and worked in the Lake District and it was inspiring to meet at first hand the infectious and instructive enthusiasm for all aspects of Natural History described by friends still living in Norwich.

The highlight of the year must surely be the isolation of the elusive virus responsible for the infamous "Red squirrel disease". We have appealed for several years now for carcasses of red squirrels or better still news of animals obviously infected. Dr. Ian Keymer worked to isolate the causative agent with no success until this year when the scheme he devised to transfer tissue with the utmost speed to an electron microscope proved itself. Mr. D. Neal's report of an infected animal at Blickling was acted upon immediately and in spite of the considerable journey involved the virus could still be found. Dr. Keymer needs more material to work upon and would appreciate reports of suspected cases. In order to save as much time as possible, please contact him directly at the Veterinary Investigation Centre, Norwich, Tel: 46278. We hope to include a proper account of this work in a future edition of the Report.

Looking to the future, it has been encouraging to meet so many enthusiastic and observant youngsters during the year. Many boys and girls have taken part in quite intensive activities organised by our organisations, Trust and Society. Others plough their lonely furrows while the most fortunate are those with parents who support and assist. Our youngest contributor, nine years old at that time, is Miss Jane Brewster who tells of the very well concealed Harvest Mouse nest she discovered in Aldborough. That knowledgeable group, the Young Ornithologists' Club (Norwich) now collect and send in mammal notes. One of their adult leaders, Mike Wood, brings us round full cycle by reminding us of some notes on Norfolk Mammals contributed by Frank Norgate to Mason's "History of Norfolk", 1884. The rarities then were the Polecat and the Marten though both were mentioned. The Otter was described as "Common in most of our Broads and large pools and in most of the streams. Five were killed by one man in the Wensum river at Sparham in the spring of 1882". What high proportion of our total otter population will five be in the spring of 1982? Other references to these notes will be made in the Classified Notes.

Our main article is by A. E. Vine. His article on Badgers in Norfolk printed in the 1970 Report is the standard reference paper on the subject. Now, a decade on, he brings us up to date. It is obvious that the collection of information means the expenditure of time, energy and resources but it often happens that an intensive study of

this nature becomes linked with the championing of the species concerned. This is a suitable opportunity to acknowledge Tony's invaluable work on behalf of this Norfolk mammal that needs its dedicated advocates.

The Editor thanks contributors for their submissions, great or small and regrets not being able to send personal acknowledgements to them all, but does emphasise that every scrap of information is worthwhile and is filed and retained at the Castle Museum where it will provide source material for naturalists and students of the future. The quantity of contributions is increasing and demonstrates a growing interest in mammals.

Grateful thanks go to certain specialists for their help: Dr. I. F. Keymer, Veterinary Investigation Centre, Dr. L. M. Gosling, Coypu Research Laboratories, Rex Whitta, Wildlife Ranger, Forestry Commission District Office, Santon Downham, Percy Trett for his help with North Sea mammals and John Goldsmith at the Castle Museum, Norwich. John will continue to answer queries on all vertebrates directed to him at the Museum. His telephone number is Norwich 611277 ext. 287.

Please send notes for the 1981 Report as early as possible in the new year, preferably by the end of January 1982. They should be addressed to R. C. Hancy, 124 Fakenham Road, Taverham, Norwich, NR8 6QH. If you wish to discuss any observation on mammals please ring the Editor on Norwich 860042.

Norfolk Badgers 1971-1981

THE TOTAL numbers of occupied badger setts in Norfolk during the 1971-1981 decade have remained very stable, fluctuating between 25 and 35 in any one year. In one area in particular, following successful reintroductions, good reoccupation of former setts was followed by a spread to several completely new sites. In the north-west the success story at Ringstead has been well publicised, while in the south-west came confirmation of an isolated sett that had become established before 1971. Another introduction attempt was initially successful, but unfortunately came to an abrupt halt due to gassing. There have also been losses from various causes.

FENLAND

West of the Ouse the old sites have been rechecked at intervals but never found to be re-occupied. Very surprisingly, in March 1978 a dead badger was found at Hay Green, Terrington and there were reports of a pair having originally been seen. This is only a few miles from the original setts, finally thought to have finished with their being gassed in 1970, leading to the hope that they might have survived somewhere in the area. Although searches of likely areas and enquiries proved fruitless, there is always a chance that just such a refuge might still be discovered. The body was taken to the Ministry of Agriculture laboratories in Cambridge and confirmed to be free from any T.B. infection, as has been the case with all others examined from eastern England.

March 1978 may have been for some reason a time of exploration for west Norfolk badgers, for there were one or two other reports of wandering animals in the same few weeks. In an equally unlikely Fenland locality, one (a female) was killed by a car on the road alongside the River Ouse just south of the railway Ouse Bridge between Denver Sluice and Ten Mile Bank. Enquiries in the district led to the discovery that a year or two previously one had been seen on the same quiet riverside road between Littleport and Ten Mile Bank. One was seen crossing the A1101 between Three Holes and Lakes End, near Welney, in February 1980.

A 1968 report of one trapped, and taken to Great Witchingham, at another Fenland locality was given subsequent support by the realisation, since 1971, that a sett had become established nearby, probably in the late 1960s. The keeper on this estate has allowed them to remain at their original site, but discouraged the establishment of subsidiary setts. A number of snared animals have been released in the Forestry woodlands in the Weeting area. It seems likely that a completely new sett in Suffolk established in 1980/81 was from animals spreading from this sett.

GREENSAND BELT

This has been the main area of expansion in Norfolk during the decade. The sad loss of a whole population of badgers from two areas in March-April 1968 due to their scavenging on dead Woodpigeons which had themselves been killed by consuming dieldrin-dressed spring drilled corn was described in the 1971 survey. After three years during which every sett in the district remained dormant, a total of 8 badgers was reintroduced to the main sett by the writer over a two year period, 1971-1972. Six of these came from the north Midlands, one from Berkshire (retrieved by a keeper from a snare) and one which had been in captivity in east Norfolk as a cub, having apparently been obtained when roadworks cut into a sett somewhere between Norwich and Fakenham.

In 1974 another was due to be released here, but had other ideas. It had been injured by a car on a road in the Lincolnshire Fens at Cowbit (again no setts now known thereabouts), cared for by the R.S.P.C.A. and their vet, and kept in custody in the Spalding Police dog compound until the morning on which it was due to be released, when it was found to have gnawed its way through the steel netting and escaped!

A further animal from near Ipswich had also been knocked down by a car and cared for by the R.S.P.C.A., their vet having set a broken leg, and this was successfully introduced into an adjacent sett to the main one, making 9 in all, in May 1979.

After one or two periods of absence initially, usually following the release of only single animals, the main sett became permanently occupied and enlarged in size. Unfortunately as the Forestry Commission pines have grown up, it has tended to become more cut-off from feeding areas outside, so the sett may be becoming less suitable.

Following the successful reintroduction here, the badgers eventually, after 5 years, started to spread out to other sites. In 1978 cubs were raised in a very small sett in the side of a deep ditch in a new locality, but the family vacated the site when stubble burning took place on the field above. Since then foxes have used it, but on other than very brief visits badgers have not been back.

In the same year news came in of one being shot in mistake for a fox near to a group of setts which had not been used since 1966. Investigation showed that first one and then three in the group of 5 long disused setts had become active again. They have since continued to use only one main sett in this group, but there has recently been considerable disturbance due to tree felling and scrub clearance and there may be plans for ditches to be cut through the area.

Later in 1978 another brand new sett was discovered in an area where they had never been known before. Foxes had been causing trouble on a chicken farm and as a result their suspected earth in a hedge bank was being dug into in order to destroy the family. When it was opened up and a badger sow and cubs were revealed the landowner immediately ordered his men to fill it in and leave them undisturbed. Fortunately, despite the intrusion, the badgers remained, digging out a fresh entrance, and there are signs of other setts appearing in the vicinity. In fact the further remarkable tenacity of this pair was shown by their remaining about a year later, even though the bank and hedge were bulldozed away, completely exposing the entrances.

In 1979 an old Forestry Commission sett some distance from the original main sett was recolonised and very considerably enlarged and a further, new, very small sett opened up in a rabbit warren at another nearby site. Unfortunately both of these have ceased to be occupied more recently.

In the same year another new sett was started in the district, badgers taking over a fox earth in the edge of a wood, where they have continued to prosper. Unfortunately spoil heaps from holes dug in the side of the ditch bordering the wood obstructed the flow of water. The writer then laboriously dug this out and inserted some lengths of concrete pipes, so that fresh soil fell onto them but allowed the water to flow unimpeded within the pipes. This would have been successful but for the fact that the badgers still continue to excavate further holes along the ditch. Another worry has arisen with this sett as poisoned worms are inserted into mole runs in order to kill the abundant mole population on adjacent fields. As the badgers were digging into the mole runs the effects could be disasterous, but so far they have survived and no dead animals have been found.

The expansion of this group of badgers continued with a further new sett in 1980 — also taking over an old fox earth in the edge of a wood with an adjacent ditch. Before the presence of this sett was known, a road casualty on the nearby A47 was reported. It might be added that at least 5 road casualties have been reported in the vicinity of the original main sett.

Slightly further east, in the chalk — sand region 6 animals of north Midlands stock were introduced commencing in 1970. It was these original introductions that lead to arrangements for the 1971-72 reintroductions described previously. Here after using an initial small sett in the release wood they made 3 separate setts in conifer woodland. One of these was well used until 1973, when 2 dead cubs which had been gassed were discovered lying near the entrance. All the setts had been gassed by the keeper's assistant in anti-fox operations and this led to the end of the colony. One was killed on the A47 in 1972. About 2 miles away another sett in an isolated pit was occupied for a few months in 1980-81. A pregnant sow badger which had actually dug out a very small sett was snared at the southern end of the greensand belt and released in a wood 4 miles from this pit just at this time. Perhaps one of the original group of 3 might be reoccupied as fresh tracks have been seen in their vicinity.

The only greensand sett known to be occupied at the time of the 1971 paper mysteriously smelt strongly of diesel in that same year and was no longer in use. However in 1974 they were found to be back and may have survived at another still undiscovered location during that period. Unfortunately by the end of 1977 the sett was again vacant.

In 1978, the year when several wanderers away from regular areas were found, a few miles from here a pair enlarged a rabbit burrow on a rough piece of bracken and elder-covered land for a few weeks, but did not remain. There was also a road casualty at Little Massingham in March, 1980.

Away to the north at Ringstead, through the efforts of Lord Melchett making several introductions of captive badgers from Philip Wayre's Great Witchingham Norfolk Wildlife Park, starting in 1974, a sett was eventually established on his estate in a dry pit. In 1979 they successfully reared young — one of which is shown on Lord Melchett's photograph. In 1976 one was seen 4 miles away at Snettisham, perhaps one of the original introductions that had wandered. However they have also dug out a second sett on the estate and it is pleasing to think that the future is reasonably hopeful for the species in this completely new area.

CENTRAL NORFOLK

This is still the main stronghold for the county. First, however, must be mentioned the rather more isolated sett to the south-west of the main group. Although a long established sett, this became empty in about 1975, possibly because of some earth moving disturbance nearby. Two miles away a badger was seen crossing a by-road early one morning, perhaps to an undiscovered sett.

Moving on to the main concentration, information was given of the regular occupation of one sett since prior to 1971, which may be in an artificial fox earth, although I have been unable to make a visit. This was not included in the 1971 paper although reference to animals seen at this locality was made at that time.

Next a large sett in a Forestry Commission pine plantation has suffered mixed fortunes due to interference. It was certainly in use into 1974 and may have been in partial occupation in 1975, 1977 and perhaps at other periods. Two miles away a pithole sett has remained in constant use under the watchful eye of a favourable management. In this vicinity there have been one or two other setts used at various periods. A nearby parish has setts in at least two places. At one of these in the edge of a wood occupation continues although earth stopping still occurs and a nearby wood may be used sometimes. The other has one main sett in a bank and subsidiary setts in an artificial earth and in other woodland; they have not been checked lately but are believed to be satisfactory.

A sett on a common in the next village appears not to have been in use for some years, but in 1979 a completely new sett was found in a railway cutting — from which some of the spoil almost reaches the track.

The most important group of setts in Norfolk has continued to prosper. The main concentration in woodland now consists of 8 occupied and 5 disused setts — all separate from each other. Thus whereas there had been 12-14 setts in all by 1971, the total now stands at 22 setts (13 occupied) including some newly started but later disused.

The attractions of this locality have been (i) a sympathetic landowner and freedom from disturbance; (ii) old deciduous woodland providing both cover for the setts and good feeding grounds; (iii) marshy water meadows — equally important for feeding grounds — alongside a stream; (iv) a large acreage of grassland providing valuable feeding areas, for sheep farming and (v) an easily dug loamy sand.

In 1980 the estate was taken over by the adjacent landowner, who already had a sett in a small wood on his farm and has seen other signs of them around his house. Although there is a proposal to convert some of the woodland to arable, the only other significant change in farming practice is that sheep will no longer be kept and the whole farm will become arable, but there is still some grassland in the area. However it remains to be seen whether the large reduction in grassland will have a long-term effect on the numbers of badgers.

The strongest reason for the generally low numbers of badgers in East Anglia compared with the rest of the country seems likely to be connected with the predominance of arable farming and resultant lack of grassland from which their single most important food item — earthworms — is most readily obtained.

Nearby a small sett in a belt of trees appears to have continued in use, but little is known about it. In 1973-74 two miles north of here a badger took over an artificial fox earth, but it is not known what developed from this. At about the same time came reports of reoccupation at the important 1950s-1960s group of setts in Forestry

Commission woodland and adjacent heathland, but these could not be substantiated; most of the heathland was ploughed up at this time in any case, while the pine forest had grown towards maturity and looked less suitable than in the young preferred stage.

Further towards Norwich a good sett on Forestry Commission land had started by 1975 and in that same year about a mile to the east a badger was disturbed by the Hunt from an artificial fox earth and three small setts were discovered nearby. Two of these were in an open field and were later taken over by foxes. In fact slurry was dumped down them to discourage their use. The other main sett, only one hole, and the artificial also ceased to be used.

Within 1½ miles of the Forestry sett there was certainly evidence of two further setts during the mid 1970s — one in a valley pine wood, near where a badger was found dead in a snare and another killed on a road and the other in a narrow belt of trees to the south. Not far from this a badger was seen crossing a road near to two different fox earths and it seems likely that there may be other setts in the district. A further small sett in a wood about 4 miles to the east has also continued to be occupied. An animal was also reported from woodland behind gardens in a Wensum valley surburban village.

Some miles to the north of this district a sett was established in 1971 at the edge of an extensive woodland nature reserve, but regrettably ceased to exist in 1974 when it was gassed by employees of the adjacent farm when eradicating rabbits.

In the same area of wooded country two more setts for which information came in during 1978 were in regular use during the 1960s, but a check in 1978 indicated they probably ceased to be occupied by the mid 1970s.

NORTH NORFOLK

Nearer the coast in 1973 a landowner introduced two sow badgers into a long disused sett which he surrounded by wire netting, with the information that they would be sure to attract all the boar badgers from miles around. Unfortunately the sows did the seeking — one went through the wire netting immediately and the other had gone by the following day. As some expense had been involved the owner felt unwilling to try the experiment again.

The situation on the Cromer ridge is far from satisfactory and it is highly likely that no badgers have survived in this district. In one Forestry Commission area, which held an occupied and two empty setts in 1971, a recent visit showed these setts were long disused — at least by 1976. Timber extraction might perhaps have been a contributory factor. A neighbouring area of woodland where there was certainly one sett in 1971 — from which the boar was snared and the pregnant sow run over — now has the site covered by a rubbish tip, while there is no evidence of another site higher up in the hills having been used in the last 10 years. The district once supported a reasonable population of badgers but no reports have come in in recent years of any occurrences.

For the area between the Cromer ridge and Norwich almost no fresh information has become available either. At one locality badgers were said to have been seen out in a field and a sett to have been found, which was later destroyed, in a hedgebank. However a visit to the site in 1978 did not reveal anything very convincing.

Black Tern autumn passage was on a small scale; no party exceeding 12 birds. Late individuals appeared at Snettisham October 11th and 18th. *(Photos: P. Munsterman).*

These Badger photographs by Lord Melchett show his successful family group. In the lower, the two adults are approaching the sett while the cub is climbing away up the slope to the left. The upper photograph shows the cub diving into the main entrance to the sett.

EAST OF NORWICH

The pleasing news from here is that one sett in a shallow pit which ceased to be occupied in 1970 was in fact reoccupied in 1974. In view of their absence for nearly 4 years there must evidently be an unrecorded sett in the vicinity as this is unlikely to have been recolonised from mid Norfolk. At another village where there had been a sett many years ago, but nothing had been recorded in the intermediate years, a small sett at the bottom of a large garden was used from 1976 to 1978, while there may have been occupation at some periods on some heathland under pine trees in the same village. A possible Broadland report (Norf. Report for 1975) only revealed rather large rabbit holes. Lastly the isolated sett in the far south east appears to have become inactive by the mid 1970s, but no recent visit has been made to check on the current position.

SOME ASPECTS OF THE DECADE

The status of the badger in mid-Norfolk, its stronghold in the county, has remained broadly similar, with 1 or 2 losses but also a strengthening of its position with several new setts and some new developments in the country to the east. Conversely the Cromer ridge has probably lost all of its badgers — although it would be good to learn that they are still active in the district. It still survives in east Norfolk and there may be one or two unlocated setts. On the other hand, in the west it has regained much of its former range and colonised new ground.

Introductions have been made at 4 localities during the period:—

1. 1970-72. West Norfolk. 6 animals. Initially quite successful with 4 separate setts opened up, of which one was in regular use, but all gassed in 1973.

2. 1971-72. West Norfolk. 8 animals and a 9th later. Became firmly established in the old sett into which they were introduced. Between 1977 and 1980 spread out to a total of 9 other places within a 5 mile radius, 5 of which were completely new. Currently 5 of these setts are active.

3. 1973. North near Cromer ridge. 2 animals introduced into long disused sett but departed immediately.

4. 1974-76. Ringstead. 5 animals introduced into old rabbit holes in pit, which they developed into a sett and by 1980 had started at another site nearby. In 1980 two more from Kent were introduced at a different site, but departed immediately.

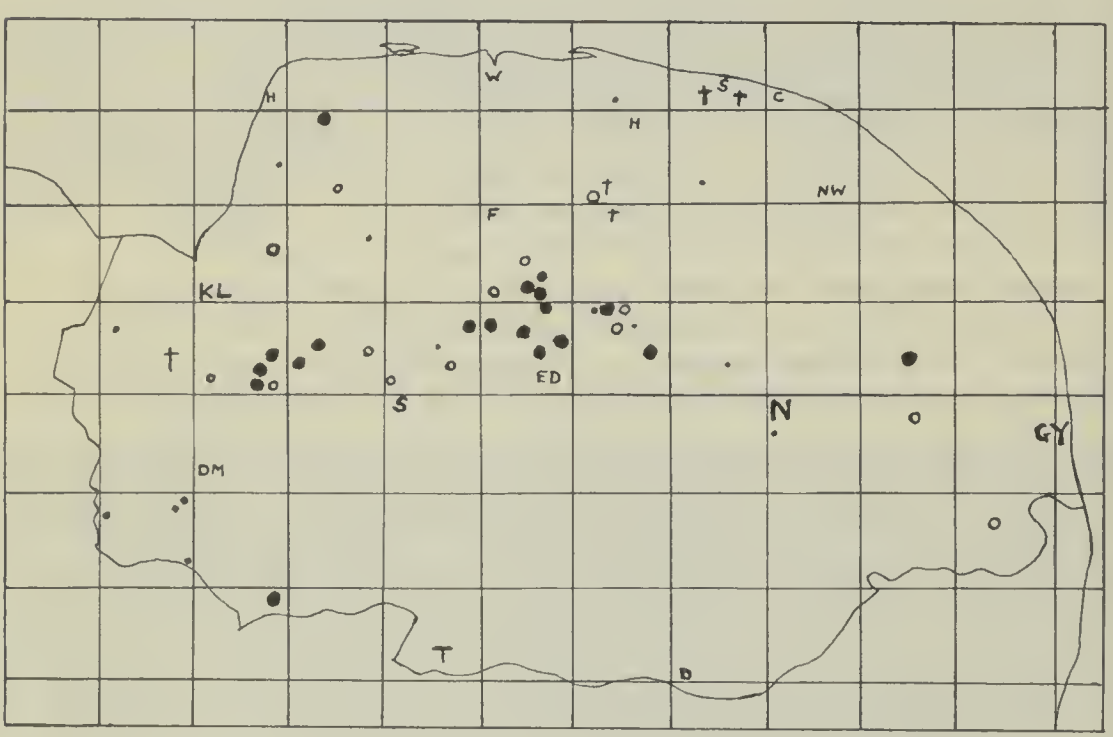
It seems highly likely that most of west Norfolk would now be lacking in badgers if these introductions had not been made and the trouble and expense involved would appear to be well justified in returning a worthy and attractive member of our fauna to a part of its range from which it had been lost due largely to the action of man.

Turning to the causes for change, in most cases the reasons are not known and may be just a natural decision to abandon a site — it is not at all unusual for badgers to vacate a sett for some months, only to return at a later date. However there were two known gassing incidents during the decade, one for rabbits and the other said to be for foxes. In two cases the badgers were deliberately evicted, once with diesel and the other with an unknown noxious substance. Four other departures were all due to accidental causes — fire (including stubble burning), earth moving and forestry work.

Concerning individual animals, the highest number of cases was of 15 road casualties, but this must be incomplete and is in any case far lower than for most other counties. Two animals shot and two killed by snares were reported, but there were 4 known cases of their being safely extracted and released, although there must have been more incidents than this.

Despite there still being a limited number of places where the badger is regarded as vermin, it is very encouraging to know that on most estates it is now more than welcome. Landowners and keepers show a much greater interest in having them on their estates and many have been extremely helpful in providing information to assist in compiling this account, as have many other correspondents too numerous to list.

Acknowledgement for providing the badgers used in the introduction attempts is also due to:—
a) Sam Oates for 12 from the North Midlands,
b) Philip Wayre's Norfolk Wildlife Park for 7 home-bred animals,
c) a Kent source for a pair,
d) friends in Berkshire for one,
e) the R.S.P.C.A. and friends in Ipswich for another,
f) the R.S.P.C.A. for the Spalding one that got away.



Distribution of Badgers in Norfolk, 1971-1981

Key to map

Setts less than 500 yards apart are shown under one symbol.

The initial letters of main towns are shown, and also the 10 Km. grid squares.

● sett or group of setts occupied in 1981.
○ sett or group of setts used since 1971 but not occupied in 1981.
† former setts or groups of setts completely disused by early 1970s.
• individual records away from setts.

NUMBERS OF BADGER SETTS IN NORFOLK

	Disused 1981	Active 1981
Recorded in 1971 Paper: 123		
Disused pre 1971 and remained so	89	—
Occupied pre 1971 but disused then, later restarted		
a) and still in use	—	4
b) but disused again	5	—
Occupied in 1971 and still in use	—	13
Occupied in 1971 but since disused	12	—
Newly recorded for 1981 paper: 37		
Disused pre 1971 and remained so	5	—
Occupied pre 1971 and still in use	—	2
Started after 1971 and still in use	—	13
Started after 1971 but since disused	17	—
Total recorded to date: 160	128	32

Classified Notes

INSECTIVORA

The eccentric behaviour and omnivorous feeding habits of the Hedgehog (*Erinaceus europaeus)* are both exemplified by the East Tuddenham youngster that continued feeding whilst being carried indoors and then out again all the while balanced on the dog's supper dish. If we may speak in human terms, this rugged attitude to life surely helps to maintain the good numbers observed. Our travelling reporter from Swaffham, Mrs. J. E. Gaffney counted 198 road casualties between 28th February and the 16th December, more than twice the number found during 1979. A regular traveller along the B1149 between Holt and Norwich Airport counted 45. This particular contributor was in Taverham Hall grounds on the evening of the 15th December with the temperature between 1 and 2 degrees Centigrade when he saw a hedgehog foraging in the grass. Earlier in the year he was shown a courgette taken from a field at Old Buckenham which had mysterious teeth marks. A rabbit was suspected but later the farmer himself caught the culprit in the act — a hedgehog.

The easiest mammal to record so far as localities are concerned is the Mole *(Talpa europaea).* So easy that in fact it is frequently overlooked! Some of our contributors provide a thoroughly prepared list based on Ordnance Survey references and the west of the county is very well covered. The most interesting systematic survey in the eastern half was carried out by Mr. E. Daniels as a mammalian extra to a botanical survey in East Norfolk churchyards. His list would fill a substantial part of the report if printed in full. It is worth saying that apart from those that are tidied with an excess of enthusiasm our churchyards are rich areas for students in many branches of Natural History and many sets of mammal notes include such references.

By publishing date the time of greatest aggravation to gardeners by moles will be over but moles may well be present, making use of established tunnels. If a hill is flattened by forcing soil downwards it often re-erupts due to the activity of the same or another mole. It is sometimes possible to effect a compromise solution by levelling the heap. We do not know whether a peaceful solution was the outcome when a Saxthorpe gardener sat on his bench for a rest and a mole came to the surface between his feet.

A Common Shrew *(Sorex araneus)* caught in a Longworth trap at Daffy Green and held in a transparent bag showed its indifference by making a substantial breakfast of meal-worms. Many contributors speak of large numbers killed by cats, including the one that defiantly bit the cat on the nose before succumbing. Large proportions of the total catch from live trappings are also reported so it appears that 1980 was a peak year for this species. The one seen eating bread and Ryvita at Holme in the company of rodents may not be typical nor do we expect Pygmy Shrew *(Sorex minutus)* to be a connoisseur of cheese. However, more than one report speaks of it being found in traps baited with cheese including mummified remains recovered from a trap in an Edgefield attic. The shrew had presumably climbed to the attic by the honeysuckle on the outside wall to a height of some 30 feet but it is clear that no extra aid is really required because at East Tuddenham one was seen running up and down the wall surface itself. An albino specimen was found at Wissonsett in September.

Nine localities for Water Shrew *(Neomys fodiens)* were received. The one from Royden was an unusual species to be listed as a road casualty. Another was found dead on the river bank at Feltwell, but at Lolly Moor, Gillingham and Holme observers were able to watch these delightful creatures in action.

CHIROPTERA

Records of bats are slowly being accumulated by more contributors attempting to note these difficult mammals and by the systematic searches made by John Goldsmith from Norwich and by Dick Jones from his King's Lynn museum base.

A Whiskered Bat *(Myotis mystacinus)* was found at Grimes Graves in February, after several unrecorded years. Daubenton's Bat *(Myotis daubentoni)* is found regularly in winter roosts in small numbers. This year a large colony was found in a tunnel in the Stanford Training Area and another small colony of males in a hollow tree in Thetford Forest. Barbastelle *(Barbastella barbastellus)* records for the county come from thirteen confirmed 10 Km. squares, 4 of these being pre-1950 and one being added during 1980. This was the individual that was killed by a car at Stanhoe. There is no recent evidence of the colony that was once known to exist at Calthorpe. The driver of the car mentioned above had the added misfortune to hit and kill a Long-eared Bat *(Plectotus auritus)*. This species appears to be in more danger of this type of accident and as in previous years we have heard of individuals being killed by cats. More fortunate Long-eared bats were found in Horsey church and at Letheringsett where they were disturbed by a timber merchant.

Pipistrelles *(Pipistrellus pipistrellus)* are the most frequently recorded bats. The first of the year was on 2nd January when one was flying round a cottage at Seething at 7.30 p.m. The Taverham maternity colony caused some consternation when a few members accidently found their way through from a cavity wall into the lounge of a private house. After some hasty repairs to the coving, both householders and bats

were happy. It should be mentioned that the repairs mentioned were not necessary because of any actual damage done by the bats.

One was found dying during August in the centre of King's Lynn. When the carcase was analysed it was found to be heavily contaminated with D.D.T. Later enquiries suggested that it had been roosting where a wasps' nest had been destroyed by this long-lasting chemical over ten years previously.

LAGOMORPHA

The Rabbit *(Oryctolagus cuniculis)* seems to be gradually winning its own battle with myxomatosis. Although the disease continues to take a heavy toll in many districts the population has built up in others, particularly in parts of Breckland, to almost pre-myxomatosis levels. This is reported by two contributors who have been active in this part of Norfolk for many years. In the afforested sectors, active control measures have kept numbers to what is described as "a reasonable level".

The ability of the rabbit to take advantage of available space is seen in the larger litters and longer breeding season of post-myxomatosis colonies. On January 31st, two dead young between two and three weeks old were found in Houghton Park. The breeding season begins as early as this in favourable weather conditions and, in addition, a few does will always produce some out-of-season litters. The effects of myxomatosis were seen all over the county mainly from June onwards but one observer who saw live rabbits on no less than 344 occasions during the year encountered diseased individuals from March 25th through to December 16th. A count of "53 pairs of ears" at a warren at Cley on April 3rd was up to 96 pairs when the count was repeated on May 1st. The most startled rabbit may have been the one chased by a squirrel at Fritton Decoy. It continued to run well after the squirrel had returned to the trees.

While not all contributors agree on the decline in the Brown Hare *(Lepus capensis)* most of the 20 who sent notes on this species indicate fewer individuals seen. One compares live sightings as follows: 1978 — 77, 1979 — 45, 1980 — 28. Road casualties 1978 — 15, 1979 — 16, 1980 — 13.

The all-cream specimen seen at Hockham a year or so ago seems to have produced one or two all-cream offspring as on two occasions two of this colour were seen together.

In January 1981, strictly outside our year, many hares that had been found dead were submitted for post-mortem examination. In spite of the unusual circumstance no common factor could then be found and they seemed to have died from various causes. Perhaps further work will provide an answer.

RODENTIA

If the number of entries on the record cards were the only criterion we would have a rise in Red squirrels *(Sciurus vulgaris)* to report. In fact the sight of a Red Squirrel is now a significant event in all but a handful of localities while the Grey Squirrel *(Sciurus carolinensis)* is seen even more frequently than before and continues to increase its range. An example is Wolferton where the once frequent red was not seen in 1980 by Dr. C. P. Petch but where the grey is now common. A newspaper article encouraged reports from many new contributors. Most spoke of singles but we know that where reds are present in Thetford Forest there was no significant decline. Sadly

there are very few other areas where the population is likely to be maintained. The rabbit chaser at Fritton has already been mentioned. Another at Alby Hill came to drink at the bird bath. Two were seen at Seething airfield running unaccountably in a very straight line across country. A sighting was made in Thorpe Woods after a gap of a year and a half in the spring but has not been repeated since.

A Grey squirrel was suspected of taking swallow's eggs at Holme Observatory. In contrast, four were living up to their more charming image when they were watched by a member of the Y.O.C. as they played tag in Ipswich Road, Norwich just after Christmas. Perhaps the one on the B.B.C. doorstep was seeking more favourable publicity. Attempts at controlling numbers on one mid-Norfolk estate has resulted in over 1,000 being killed in three years with no obvious diminution of numbers.

Live traps set on a farm at Daffy Green, Dereham over several weekends produced large numbers of Bank Voles *(Clethrionomys glareolus)* including two in one trap. 21 other sites were reported, some live sightings, some caught by cats and others found in owl pellets. A trapping exercise on the Stanford Training Area caught 23 against 5 Short-tailed field voles *(Microtus agrestis)*. On the other hand figures from owl pellets at Tottington and Buckenham were 7 to 23 and 10 to 61. Short-tailed field voles were the chief recorded prey of that well-documented cat from East Tuddenham and two Burmese at Edgefield found them much to their fancy and obviously freely available. The Burmese have their catches of birds and mammals listed inside the kitchen door, a quick and efficient method of recording.

Water Voles *(Arvicola terrestris)* were increasing at Holme Marsh and were seen in fair numbers at East Tuddenham. Breckland rivers are reasonably well stocked and six were seen in one day by a visitor to Cley. Reports have come in from all over the rest of the county but only Crostwick, Hickling and Reedham represent that vast Broadland area of potential Water vole country.

The Wood Mouse *(Apodemus sylvaticus)* can be found in most districts partly no doubt due to their ability to adapt and tackle different foods. We have heard of candles, crocuses and carbolic soap being consumed but the tables were turned when an *Eastern Daily Press* reader saw a mouse being swallowed by a chicken. Some hens will take mice very readily and a nest of young discovered under a coop that is being moved will attract a few fowl with an eye to the main chance. It was pleasing to hear that the Forncett St. Peter colony of Yellow-necked mice *(Apodemus flavicollis)* is still going strong. They were visiting the kitchen draining board to eat the soap! Another was caught by a cat at Broome, confirming their continuing presence in the Waveney valley.

The House Mouse *(Mus musculus)* is numerous in more restricted areas. Coincidence plays strange tricks. This year so many small mammals have been seen running up and down walls and the House Mouse was one of them. A normal wall has many gripping surfaces for small feet and body weight is very low so running up must be comparatively easy but running down again must surely be quite difficult for any creature on a vertical plane. Many come into buildings during the winter and a House Mouse at Mulbarton set up house in a piece of foil behind the cooker. In another situation the foil in a drawer was actually eaten. Numerous House Mice were seen in a garden at Attlebridge and in the same garden a Harvest Mouse *(Micromys minutus)* was caught by a cat. Harvest Mice do not turn up very often in live traps. When available, owl pellets provide a much better indication. 15 were found in pellets from Buckenham. The other method is to look for nests and these were seen for instance at Holme and at Aldborough by the observant young lady mentioned in the Editorial.

The Brown Rat *(Rattus norvegicus)* is a most under-recorded mammal and its lifestyle and cycle is so tied up with our own that it is difficult to disentangle the true story. Mrs. Gaffney's road casualty list was slightly down on previous years but another keen contributor from central Norfolk described 1980 as a "plague" year. The Barn Owl at Panxworth did its best. Pellet analysis discovered a very high percentage of rat skulls. One successful strike at a rat is worth several mice or voles to the owl.

The Coypu *(Myocastor coypus)* killed on the drive of Keswick Hall College of Education may have been martyred by its thirst for knowledge. For a more serious analysis of the situation to spring 1981 we are again indebted to Dr. L. M. Gosling of the Coypu Research Laboratory.

He says "Coypu numbers were higher in 1980 than in 1979 because the intervening winter was mild and the trapper force too small to prevent an increase under these conditions. Adult females remained in good condition through the winter and over 40% littered between March and May giving a good start to the year's breeding. The number of adults rose from 4,900 in October 1979 to 6,600 in the same month in 1980. Nearly 9,800 coypus were killed in control operations during 1980 (mainly in Norfolk and Suffolk) and about 7,100 of these were adults.

"1980 also saw the start of an intensified campaign against coypus. The operation did not start officially until April 1981 but, in practise, recruitment of new trappers started in the autumn of 1980. The new force consists of 24 trappers with 3 foremen and a manager. As a result of their efforts the numbers killed per month rose to over one thousand at the end of the year and research suggests that the live population is declining.

"Cage-trapping is the sole technique used in the new campaign and the trappers are instructed to release all 'non-target' captures unharmed; the only exceptions are brown rats, mink and rabbits which, like coypus, are shot when the traps are inspected each day. The release of non-target species, which include otters, water voles and many species of birds, is a vital aspect of the operation because, with an annual trapping effort of over 200,000 trap nights in coming years, the impact on wildlife might otherwise be considerable."

CETACEA

Norgate described the Common Porpoise *(Phocoena phocoena)* as frequent but that may well have been in comparison with other cetacea in which case the description still applies in so far as four individuals were recorded during the year. One was washed up on the beach at Titchwell in June, one between Holme and Hunstanton in the spring, another was decomposing at Winterton during August and finally one was sighted swimming off Cley in October. One other cetacean, a White-beaked Dolphin (*Lagenorhynchus albirostris)* was found dead at Holme in May.

CARNIVORA

Some comments in the *"Eastern Evening News"* describe the coincidence of two factors at the time of the appearance of the Fox *(Vulpes vulpes)* on Breydon Marshes in increasing numbers. They were the catastrophic decline of the rabbit elsewhere due to myxomatosis and the establishment of the coypu. R.H.H. raises interesting questions on the results of coypu trapping on the one hand and rabbit resistance to myxomatosis on the other. Taking the county as a whole there is contradictory evidence

from contributors. Of three reports from Breckland, one says it is not as common as twenty years ago, another about the same, while the S.T.A. Headquarters Staff describe the fox as very common. It must be admitted that the last source would not be able to make comparative judgements. A typical former stronghold was Swannington Upgate Common with lots of fox signs. There is now ever increasing human activity including horse riding but no sign of foxes. It is assumed they have been driven deeper into the woods. A fox was checked in its stalking of a domestic cat in Brundall and it was guessed that a number of cats that had disappeared in the village in the same week had been its prey.

Two 19th century notes need no further comment:
"Fox — Common, but imported and preserved for hunting".
"Badger — A few have been killed in the county in my time, but they were probably some which had been imported to make earths for foxes."

The present status of the Badger *(Meles meles)* is dealt with elsewhere. One example of the way it turns up in odd places from time to time was the early morning surprise for the milkman in Thorpe, Norwich, when he saw one crossing a lawn.

Norgate's note on the Otter *(Lutra lutra)* has already been quoted. Breeding did occur last year and with the change in attitude we have seen in recent years towards this creature it is possible that we will be able to share parts of our county with it. How refreshing to hear of the trout farmer who is pleased to see his visiting otters!

On the other hand we have heard of enthusiasts who have broken through the roof of a holt when seeking to record its presence. Contributors should note that reports are placed in the archives but no sites are published.

Sightings and observations suggest that the Stoat *(Mustela erminea)* may have been at a post-myxomatosis peak during the year. A number in full or half-ermine were seen, the majority in Breckland. A vivid account of a stoat killing a rabbit that had lost all its powers of escape comes from Barford. Another at Corpusty was watched for some time as it ran up and down the corner of a wall disturbing nesting swifts. A fight between a stoat and a rat was seen at Reedham by a local boy. Two weeks later a dead stoat was found with obvious evidence of being bitten in the throat. There was no witness to this encounter so we can only speculate as to the identity of the victor.

Norgate's note on the Weasel *(Mustela nivalis)* could be repeated with equal truth today — "Abundant, and extremely useful in destroying mice, but sadly persecuted." Counts of stoats and weasel often include large numbers displayed on gibbets. Numbers vary from year to year and in different parts of the county and this fluctuation is more marked with weasels than with stoats. The relative abundance of mice and voles is critical. A weasel near Watton had the misfortune to be caught by the neck between two forking stems of Sallow while the other weasel that had been chasing continued to attack from the rear. Its luck turned when a human rescuer chased away the aggressor and released the victim, after taking its photograph.

The most difficult carnivore to assess is the American Mink *(Mustela vison)*. We know of its presence in the county in relatively small numbers, but very few are actually seen. One was observed at Titchwell in September and on the other side of the county at Wheatacre by a Coypu Control trapper. Coypu control accounted for another at Gillingham. There were further reports from the Waveney valley, though strictly speaking on the Suffolk side.

PINNIPEDIA

The condition of Scroby Sands is of prime importance for our seals. During the summer breeding season of the Common Seal *(Phoca vitulina)* the bank was sufficiently stable to allow the seals to proceed about their business but not inviting enough to encourage too much human disturbance. In consequence they had a reasonably good season. Individuals noted on the sands were later picked out at Morston, Blakeney and in The Wash.

The Grey Seal *(Halichoerus grypus)* had another unfortunate season. The bulls established territories on Scroby but as the cows began to arrive the sands washed away. Some cows pupped on the mainland beaches, some quite close to astonished beach fisherman. The pups were deserted. Other cows aborted at sea. Meanwhile the bulls were setting up alternative territories on beaches and after human activity died down in the evenings the cows began to arrive. However, it was soon made very clear that the seals had to contend not only with natural hazards but gun-happy humans as well. Patrols had to be set up to protect them. Sadly, a number of severely wounded seals had to be destroyed. Holland proved a safer refuge for many.

ARTIODACTYLA

When Norgate compiled his notes a century ago he could have had no idea that today we would have such a diversity of species as well as numbers of cervidae. The occasional escapee from a deer park was seen but not regarded as a truly wild animal. In 1980 Red Deer *(Cervus elaphus)* were seen in many localities, sometimes in groups of up to five animals. The lone stag on Mousehold Heath, Norwich, startled several walkers until it came to an untimely end. It was remarkable how quickly all traces of its presence were removed! The major herd in Thetford Forest is stable and there is every hope for its future well-being. One important factor is the development of the forest itself as the more mature stands allow denser cover to grow underneath.

Colour-coded collaring of Roe deer *(Capreolus capreolus)* continues in the forest each year and a picture of roe deer movement is gradually being built up. Please make a note of the colours and banding of any collars seen and report directly to the Wildlife Ranger, Santon Downham, giving as precise a location as possible. Harassment by illegally unleashed dogs has been mentioned in previous reports. Another very serious hazard for the deer is the motor-car which has killed quite a high percentage of the colour-coded individuals.

The number of Muntjac *(Muntiacus reevesi)* continues to rise though their preference for dense cover makes them difficult to find. The male is slightly larger than the female and his height is given as up to 48 cm. at the withers so they have no difficulty in slipping away unobserved.

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Properties

Date Acquired		Acreage		Status*
	On the Coast			
1926	Cley Marshes	435	Gift	S.S.S.I.†
1937	Duchess's Pightle, Burnham Overy ...	1	Gift	——
1937	Great and Little Eye, Salthouse ...	10	Purchased	S.S.S.I.
1945	East End of Scolt Island	76	Purchased	N.N.R.
1955	The Eye, Salthouse	21	Purchased	S.S.S.I.
1965	Holme Dunes	440	Purchased, Gift & Agreement	S.S.S.I.
1980	Salthouse Marshes	100	Lease & Purchase	S.S.S.I.
	Broadland			
1928 and 1974	Starch Grass (Martham)	4	Purchased & Gift	S.S.S.I.
1930	Alderfen Broad	72	Purchased	S.S.S.I.
1945 and 1969	Hickling Broad	861	Purchased	N.N.R.
1945	Hickling Broad	500	Leased	N.N.R.
1945	Barton Broad	355	Half Gift & Half Purchased	S.S.S.I.
1952	Barton Broad			S.S.S.I.
1948	Surlingham Broad	253	Purchased	S.S.S.I.
1949	Ranworth & Cockshoot Broads ...	144	Gift	N.N.R.
1964	Firs Marsh, Burgh St. Peter	3	Leased	——
1971	Martham Broad	103	Leased	S.S.S.I.
1972	Hardley Flood	90	Leased	——
1972	Chedgrave Common	10	Leased	——
1974	Barton Marshes	10¼	Gift	——
1979	Upton Fen	120	Purchased	S.S.S.I.
	Breckland			
1938	East Wretham Heath	362	Purchased & Gift	S.S.S.I.
1942	Weeting Heath	343	Gift	N.N.R.
1949	Thetford Heath	250	Gift	N.N.R.

Norfolk Naturalists Trust Properties cont'd.

	Other Areas			
1957	Thursford Woods	25	Gift	——
1960	Hethel Old Thorn	⅛	Gift	——
1961	Scarning Fen	11	Gift	S.S.S.I.
1962	Hockham Fen (Cranberry Rough) ...	20	Purchased	S.S.S.I.
1963	Roydon Common	140	Purchased	S.S.S.I.
1966	Stoke Ferry Fen	25	Agreement	S.S.S.I.
1968	Lenwade Water	37	Agreement	——
1968	Dickleburgh Pightle	1	Agreement	——
1972	Smallburgh Fen	19	Leased	S.S.S.I.
1972	Ringstead Downs	26	Agreement	S.S.S.I.
1973	East Winch Common	80	Gift	S.S.S.I.
1974	Sparham Pools	30	Agreement	——
1975	Pope's Drift	8	Agreement	——
1975	Wayland Wood	80	Purchased	S.S.S.I.
1977	Hockering Wood	229	Agreement	S.S.S.I.
1978	Syderstone Common	60	Leased	
1978	Lolly Moor	6	Purchased	
1980	Booton Common	19	Agreement	S.S.S.I.
1981	Thompson Common	164	Purchased	S.S.S.I.

* * *

In addition, the Trust shares with the National Trust in the management of the coastal reserve at Blakeney Point (1,335 acres), and it manages Arnold's Marsh, Cley (29 acres) on behalf of the National Trust.

By arrangement with the Nature Conservancy Council, Scolt Head Island, Ranworth Broad, Hickling Broad and the Breckland Heaths now form part of the National Nature Reserves.

* * *

*Status: N.N.R. denotes National Nature Reserve
S.S.S.I. denotes Site of Special Scientific Interest

† In 1966 Cley Reserve was established as a Bird Sanctuary under the Protection of Birds Act, 1954.

THE NORFOLK NATURALISTS TRUST

Bird Watching

Excellent bird watching facilities are available from 1st April to 31st October at Hickling Broad National Nature Reserve, Cley Marshes Bird Sanctuary, Holme Dunes Nature Reserve (self-contained flat available all year) and Broadland Conservation Centre, Ranworth. Reduced rates for members, party bookings and extended periods.

For full particulars kindly forward stamped addressed envelope to **N.N.T., 72 The Close, Norwich, Norfolk NR1 4DF.**

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